THE

Malayan Agricultural Journal.

AUGUST, 1932.

EDITORIAL.

Pig Breeding

The breeding of pigs in Malaya, particularly for the local market, offers many advantages to the stock-keeper. The country appears to suit them, for they are not only easy to rear, but they breed easily, producing full litters; they thrive, rapidly putting on weight; their food is generally inexpensive and most of it can be locally produced; and they are reasonably free from disease. Furthermore, there is a ready local market for pigs.

The foregoing should not be read to mean that the pig breeder can afford to neglect his stock. On the contrary, the difference between profit and loss will be found to depend on the knowledge and industry which is brought to bear on the new problems which must constantly confront the breeder.

The old idea that pigs are naturally dirty animals and that the condition of the styes, therefore, is a point of small moment has long been exploded. In a tropical climate it is doubly important that care be exercised to maintain hygienic conditions, for although as we have said, pigs are reasonable healthy in Malaya, they are by no means immune to disease and a malady contracted by one animal can rapidly become an epidemic.

The feeding of pigs presents no very great difficulties. The accumulated experience of the Chinese pig breeders of Malaya, in the matter of feeding, will well repay study, but that is not to say that improvements are not possible by the application of more modern knowledge of the balanced ration for pigs in various stages of their development.

Mr. T. D. Marsh, Assistant Agriculturist, contributes an article in this number on Pigs in Malaya. It is proposed in subsequent numbers of this Journal to publish further articles by the same author on Diseases of Pigs and on the Pig Farm at Serdang.

It is sometimes stated that there is little profit in pig raising. It must be admitted that when all the foodstuffs have to be purchased and transported. it is only under good management that profits can be made, but when one considers that the average Chinese squatter creates about 75 per cent. of the value of his pigs by his own labour devoted to the cultivation of suitable foods for his animals, it will be realised that he is of direct service to the country in reducing the amount of money spent in foreign countries for the purchase of foodstuffs for the population of Malaya.

International Dairy Congress.

In this number there appears an account of the ninth International Dairy Congress held at Copenhagen on July 14th to 17th, 1931, written by Mr. Curtler, Assistant Agriculturist in the Department of Agriculture who attended the congress as an official delegate from the Straits Settlements and the Federated Malay States.

The congress is of particular interest in that for the first time it included a section devoted to the consideration of dairying problems in the tropics.

It is a remarkable tribute to the advance which tropical agriculture has made that it can now be regarded as definitely proved that the production of high grade milk equal in quality to the produce of the most modern dairies in temperate climates presents no great difficulties and the day can be anticipated when the production and supply of milk under hygienic and controlled condition at least in tropical towns and cities will be regarded as much as a matter of routine as in centres of population in temperate regions.

One of the principal problems with which tropical dairymen is at present faced is the type of stock best suited to requirements, and on this the final word has by no means been said. Briefly the alternatives comprise —

(*a*) the importation and acclimatisation of European breeds;

(*b*) the improvement by selection of various races of cattle indigenous to the tropics; and

(*c*) the evolution of new strains by crossing European breeds with native cattle.

Each of these systems has its advocates; it may be pointed out that under fully tropical conditions —

(*a*) is subject to the drawback that European milk cattle are liable to suffer considerably from the effects of the tropical conditions to which they are subjected on introduction and also exhibit a marked lack of resistance to the many ailments and diseases peculiar to the tropics to which cattle are subject. In relation to —

(*b*) native breeds of cattle are usually notoriously poor yielders and are difficult and intractable to handle. A modest degree of success appears to have been achieved in India in this matter but not, so far as is known, elsewhere up to the present.

(*c*) possess the advantage that crosses between European and native breeds combine to a considerable extent the docility and high-yielding qualities of the European breeds with the resistance to disease of the tropical strains. Such crosses are, however, liable to show variation in their descendants and the evolution of new fixed strains of mixed origin has not yet been achieved.

With further reference to (*a*) it should, however, be pointed out that in countries where conditions provide a climate that is not fully tropical or where a natural cold weather occurs, or even to some extent under fully tropical climates, the Friesian breed has become successfully acclimatised on a very fairly extensive scale. For example in the sub-tropical regions of South Africa and Australia, in Hongkong, in Mauritius, in the higher parts of Netherlands India and in

some of the West Indian Islands the breed has become fairly established and in general stands out as the European breed of milch cattle which is best suited for acclimatisation to tropical conditions.

In so far as the establishment of fixed breeds from crosses between imported and indigenous races is concerned, the opinion may be advanced that this is work for the scientific breeder and that when the problem is attacked on scientific lines results are practically certain to follow in due course. This method, however, cannot be expected to yield fully satisfactory results so long as haphazard methods of breeding are employed.

The Malayan Exhibition.

The organisers of the Malayan Exhibition have the satisfaction of being able to look back on an event which has fully justified their expectations. In spite of the depressed condition of trade and of our main agricultural industries, exhibits in all sections were no less than in previous years, while in some sections they were more numerous. Moreover, it is understood that the Exhibition has proved to be a financial success.

We are, however, less concerned with the statistical result of the Exhibition than with its utility at the present juncture in assisting to ameliorate the conditions in which the inhabitants find themselves by reason principally of the collapse of the product upon which they had built their hopes.

The fact is now well recognised that the future prosperity of the country depends upon widening the basis of agriculture. The Exhibition may prove a pivot for further efforts in this direction, while the encouraging speech of H.E. The Governor directs renewed attention to the subject and indicates that Government bases its hope for the future prosperity of the country on making Malaya less dependent on the import of agricultural products which may be economically produced within its borders.

Original Articles.

PIGS IN MALAYA

BY

T. D. MARSH,

Assistant Agriculturist.

The husbandry of pig raising in Malaya is chiefly in the hands of the Chinese, the flesh of the pig consituting almost exclusively the meat portion of their diet.

The Chinese population in Malaya numbered in the census in 1931, 1,710,024 (preliminary report) so it may be appreciated that a large amount of pork is consumed.

Although the industry of swine husbandry is a large one, the number of pigs recorded by the Department of Statistics Annual Report for 1930 in Malaya was 366,397 head, the imports from foreign countries are far greater than they should be considering the fact that swine can be economically fed on locally grown crops.

The number and value of net imports into Malaya of live pigs and their products during 1931 were as follows :—

Swine 147,351 head valued at	...	$ 2,735,845
Pork, fresh, frozen, and salted 289 tons valued at	...	$ 213,087
Bacon and hams, 287 tons valued at	...	$ 312,350
Total value of net imports	...	$ 3,261,282

These figures could be greatly reduced by an expansion of the pig raising industry to the great advantage of the resident population.

This branch of animal industry, apart from poultry, is the only one that can be practised almost from the first pioneering stage of the opening up of virgin jungle, inasmuch as quick-growing and maturing crops may be cultivated for food and suitable primitive housing accommodation can be provided from materials obtainable in the jungle.

Diet in Relation to Meat

The local trade prefers pork that is the result of feeding pigs, at least until they are fattened for slaughter, on a soft diet composed of succulent vegetable foods. The Chinese contend that such pork after cooking is softer and more palatable than pork which is derived from pigs fed on concentrated foods for the greater part of their life.

It is necessary, however, as the animals approach the killing age to augment the soft vegetable diet with concentrated foods, so as to obtain the desired degree of fatness, and carcase weight.

The preference for such carcases places pig raising in the hands of the vegetable gardener and small squatter, who can utilize such vegetables as are not sold for human consumption in addition to the economical growing of special crops for feeding to the animals.

As the Chinese have for generations been feeding swine in this manner, the people have become accustomed to eating soft pork and prefer it to the firmer flesh such as that marketed in the Western world.

The market in Malaya deals exclusively in pork, so that the whole of the carcase is consumed in the fresh state. There are no large bacon or ham curing factories in the country, although the Chinese cure a certain amount of pork and hams for their own market.

In the past, the Chinese have preferred a fat heavy carcase, but the modern demand in Malaya, by people other than the labouring and poor classes, is for a smaller carcase in which the proportion of lean to fat is greater. This change of taste is following that of the Western world, and may be due to the greater wealth of the community and the higher standard of living, or it may be due to a change in the vegetable portion of the diet of the Chinese people. The eating of lean meat with rice makes a better balanced ration than the consumption of a large proportion of fat with the same grain. It may here be noted fat meat contains a higher amount of energy producing food than lean meat, as it contains practically no water, whereas lean meat contains a fair proportion of moisture; fat meat would suit the manual worker and be more economical to him, provided his vegetable diet was rich enough in proteins, and it would be so in many parts of China where soya beans are the staple vegetable diet.

Meat from the young, quickly grown animal contains more lean than fat, the joints are smaller and as such, they suit the poorer class of people. Such animals are far more economical to feed to a given weight than are animals slaughtered when almost mature, since young pigs will gain one pound in weight for every four to five pounds of concentrated foods consumed, but as they approach maturity the increase in weight in proportion to the food assimilated decreases until the gain scarcely pays for the food eaten.

All animals require what is known as a maintenance diet, which is necessary to maintain life without loss or gain in weight. It is only food consumed in excess of the maintenance diet that can be utilized for increasing the weight, or similarly to produce milk or young.

Development of the Pig.

The larger breeds of pigs continue from birth to gain in weight at a faster rate and for a longer period of time than those of the smaller breeds, since the mature weight of the small breeds being much less, their increase in weight becomes slower in proportion to the food eaten.

The "porker" carcase weight which is about 70 lbs. is within the fast rate of growth of the larger breeds, and contains a greater percentage of lean meat. The smaller breeds of pigs tend to lay on fat in attaining the weight required. They become less economical as the maintenance diet has to be given for the longer period.

The above facts have a bearing on the use of the larger European breeds for crossing with the local Chinese pigs which partly accounts for the ability of the offspring to attain a killable weight at an earlier age than the local pigs. It is a well-known fact in stock breeding that improved races of farm animals make a faster growth for a given amount of food consumed than the unimproved breeds.

Pigs are the only temperate climate farm animals that can be transferred to the tropics, and be just as suited to the conditions as they are in their native habitat, provided shade is available for them, and the requisite care is taken against internal parasites. The latter precaution is equally necessary for the local animals. This adaptability may be due to the origin of the western breeds, as history tells us that the Chinese breed has been extensively used in the establishment of most of them.

The pig is a very prolific animal, the sows having two litters in the course of a year, and both sexes are quite mature for mating at eight to nine months old. It can thus be readily appreciated that a small expenditure in stud animals can in a very few years rapidly change the whole stock of the country. The first stud pigs at the Experimental Stock Farm at Serdang were imported at the beginning of 1929. Their progeny are now widely distributed throughout the country.

The Chinese Pig.

The common pig in Malaya is the black, or grey and white Chinese breed. It is noted for its prolificacy, the number of pigs in the litters averaging 10 to 12 while the sows make careful and docile mothers. This breed is reputed to be able to lay on flesh when comparatively young without unduly increasing the proportion of offal and bone. They are, however, slow to mature.

In texture the skin is fine and sparsely covered with hair, the head is of medium length, not too large, with small erect ears, the shoulders are taller and heavy in comparison with the hind quarters, the back is curved and they have a fairly steep croup, the legs are short with weak pasterns, so that the fetlocks rest on the ground. The udder hangs very low, and when the sows are pregnant, or in milk, it rests and trails on the ground. The greatly distended abdomen seen in Chinese pigs is caused by the almost universal custom of feeding on bulky vegetable foods mixed with an excessive amount of water. If the same ration is fed and water, ad lib. is given separately, the pigs loose this abnormal distension.

The flesh is considered to be of good quality. This is no doubt partly due to the custom of using a succulent vegetable diet as opposed to highly concentrated foods. The Chinese pig has been used with the Neapolitan breed in the establishment of the improved breeds of Europe and the Western Hemisphere, and the crossing of these pigs with the European breeds amounts to little more than the use of greatly improved strains of the same breed.

Breeding from immature animals, especially boars, is the common practice amongst Chinese in Malaya, which must encourage early maturity and reduce the mature size and weight. The question arises whether this practice is popular with the set purpose of early maturity, or whether it is fear on the part of the pig keepers of using a mature boar, and the difficulties encountered in view of the usual custom of carting or leading the stud boar from one holding to another. It is a fairly common sight to see boars being walked, or transported about the country in a basket on the carrier of an ordinary bicycle. The castration and marketing of immature stud boars may be practised to avoid the comparative low value of the flesh of old mature stud animals.

To revert to the hollow backs and flat pasterns, these malformations can be greatly minimised by feeding the animals with minerals from the time they are weaned, or by feeding crops that have been grown with the use of lime and phosphatic chemical fertilizers.

Another distinct type of local pig is an all black animal having many of the characteristics of the piebald type. They are shorter in the body and possess better hind-quarters. These pigs are also very prolific, the udder rests on the ground even more so than the previously described type, they make excellent mothers having a large supply of milk, and they cross very successfully with the Large Black and Middle White breeds. Other strains of pigs varying from the two types described may be due to crossing, or local selection or the crossing with local pigs of imported European stock. Some strains appear to have some of the characteristics of the Large Black and Poland China breeds.

Breeding and Selection.

When selecting the breed of pigs with which to commence pig farming, the merits of the different types should be considered for the particular market in view; for instance, if the principal trade is for porkers for the European population, then one of the large breeds such as the Large Black, Large White or Tam-worth would be suitable, since these breeds produce a porker carcase with a high percentage of lean to fat Conversely, if a carcase is required for the Chinese market, carrying a greater proportion of fat than the Middle White, Berkshire or Poland China would be suitable.

The above recommendations would also apply to the use of boars of the improved breeds when used for crossing with the Chinese pig, as the offspring invariably follows the boar in characteristics. Again, if animals are required to forage on a free range for a part of their food, then pigs with a long snout such as the three large breeds above mentioned are better adopted to such conditions.

Animals bred from healthy vigorous parents should be selected. It is desirable that the mothers of breeding animals be docile, prolific, and have at least twelve well developed teats and preferably fourteen or more, they should be good milkers and retain a good flow of milk until the litter is weaned. Unless sows have such characteristics they cannot produce good uniform litters. A good mother will lose condition when feeding her young in spite of being fed with a liberal diet of good nourishing food.

Weaners chosen for breeding purposes should be symmetrical, and have their breed characteristics well defined. They should have a fairly straight back from the shoulders to the tail, with well sprung ribs, a wide chest and wide in the loin, the hind quarters should be wide, deep, and square, the head, neck and shoulders should not be too heavy as such a conformation gives a greater proportion of the cheaper coarse meat. It is generally recognised by the trade that meat from the hind quarters of all farm animals is better than that obtained from the fore quarters. The fore legs should be set fairly wide apart and be neither knock-kneed or "pigeon toed". Young sows selected for breeding should have fourteen or more teats without any "blind" dome-shaped ones. A lesser number of teats causes weakling pigs in large litters.

The age recommended for the first mating of both sexes is eight to nine months. Some people breed from them before attaining this age, and although the practice encourages early maturity in the offspring, it has a tendency to stunt the growth of the breeding animals.

Some breeders contend that a sow will grow equally as well when she is pregnant as when she is not, while others maintain that the practice prevents a proper development of the frame. The tendency amongst present-day pig breeders is to breed from young animals, as by so doing the animals become quickly profitable. Furthermore, there is a danger of young sows becoming sterile if mating is delayed too long.

Pigs chosen for stud purposes require plenty of exercise and should be maintained in a healthy, active, thriving condition. They need in addition to the concentrated ration a liberal supply of fresh succulent green foods, or have access to a grazing ground. A daily bath in fresh running water should be given. The sexes must be separated at an early age and preferably at weaning time.

Young boars that are not required for stud purposes should be castrated at about six weeks old. At this age the shock of the operation is not great, and the young pigs, while still suckling their mother, will scarcely suffer any inconvenience. The operation is a simple one. Absolute cleanliness is essential; an aseptic sharp knife, and one dressing of an antiseptic ointment at the time of operation is all that is necessary. It is advisable that the incisions made for the removal of the testes be low enough so that no pocket is formed, and any discharge can easily drain away. The newly castrated pigs should be housed on a clean concrete floor and be given clean bedding to eliminate as far as possible the entrance of dirt into the wounds.

Ruptured pigs should be castrated by an expert or left entire, and slaughtered at an early age. It is doubtful whether the spaying of sows that are not required for breeding is commensurate with the danger of complications and the advantages gained. There is no question about the fact that such sows feed better; unspayed ones become restless and go off their food during the periods of oestrums. It is advisable to slaughter them between a period; this is essential if the flesh is to be cured for bacon and hams. In pig raising districts in Malaya itinerant spaying experts are available who become very proficient in carrying out this operation and their charges are very moderate. The danger of such persons introducing such diseases as swine fever must not be overlooked.

The Sow.

The pregnant sow should be allowed plenty of exercise up to the time of farrowing. It must here be remarked that some Chinese sows become so heavy and low in the udder that they are almost incapable of taking exercise. The sow requires a light diet of vegetable food supplemented with concentrated foods to keep her in a healthy but active condition. She should receive a little more food as the time of parturition approaches. After farrowing, the food should be of a sloppy laxative character for a few days, after which the ration may be gradually increased so that her condition be maintained and she will be able to produce a good supply of milk. The change of food should be gradual. This applies to all classes of animals, as sudden changes of diet often cause digestive troubles, and in the case of the milking sow it sometimes alters the character of the milk and causes digestive derangements of the piglets in the litter.

It is advisable to move the sow to the farrowing pen a few days before she is expected to have her litter, so that she will become accustomed to her new quarters.

A fairly large pen is desirable with a limited amount of bedding such as dried "lalang" grass cut into short lengths. A guard rail about nine to twelve inches high and nine inches from the wall should be constructed all around the inside of the building, except where the feeding trough is situated to prevent the sow from lying on members of her litter. If any space is not guarded the sow will litter in that particular place, as she prefers to lie with her back against the wall; the young pigs invariably nestle under the rail against the wall.

It is advisable to paint the navels of the young pigs soon after farrowing and again the day following, with tincture of iodine. It has been found that this treatment prevents bacterial infection, and is a useful preventative against diarrhoea which often occurs in suckling pigs at the age of about three weeks.

A careful watch must be kept for blow flies in the sow immediately after farrowing, and also in the navels of the pigs in the litter. Powdered iodoform dusted onto the affected parts or used as an ointment is a useful preventative.

Weaning and Diet of Young Pigs.

Suckling pigs may be weaned at eight weeks old, and if two or three of the weakest pigs are left with the sow for a further few days, the shock of weaning

is not so severe to the sow and the practice considerably helps the backward pigs. The alternative method is to allow the litter to have access to the mother twice a day for a few days, then once a day, and finally kept away altogether.

Some sows come into oestrum 3 days to one week after the litter has been removed, and afterwards every three weeks. The period of gestation is 112 days, so that with two months suckling two litters can be produced per annum. Should the sow be emaciated at weaning time it would be advisable to allow her to have a rest before again mating her.

Young pigs commence to eat at the age of four to five weeks. They should be encouraged to take milky foods if available to which a little easily digested meal, cake, or boiled rice has been added. It is good practice to allow the sow and her litter to graze after the litter is from two to three weeks old.

The number of litters a sow will produce is a debatable question, but in general, breeding may be continued if a sow regularly produces healthy uniform litters of a fair average number. The usual small pig or two in an otherwise good litter should not be considered to be a fault. It is essential that she has a sufficient flow of milk to feed the litter, and the flow should be maintained until the litter is weaned. When the number in the litter falls or is very uneven, or if a sow commences to eat her young, then it is advisable to feed her for slaughter.

It is possible that the cause of sows eating their young is lack of essential minerals in their system. Sometimes when the members of the litter are fighting for possession of the teats, they bite them causing pain to the sow. On such occasions, vicious sows will bite the offending piglet, and if blood is drawn the sow will often proceed to eat the young one and afterwards she may eat the whole litter. This is one sound reason why a strain of pigs having a docile contented temperament is desirable.

A useful inovation in the tropics is a permanent concrete udder bath for sows in milk. This is best placed under cover, as near to the farrowing pens as possible, and in a position where all the sows will of necessity have to pass through it on their way to the sty after taking their daily bath or exercise.

The bath at the deepest part should be about six inches with sloping floors at the entrance and exit, and about four to six feet long. The object of such a bath is to contain a non-poisonous dip or disinfectant which will destroy all parasites or eggs of parasites that might be adhering to the udder of the sow. It is an excellent preventative against internal parasites and disease germs attacking the sow and the young pigs. Proprietary dips are on the market, or bleaching powder in the proportion of one pound to 20 gallons of water is suitable for this purpose.

These baths are specially useful for Chinese sows whose udders drag along the ground when they are suckling a litter.

It has been observed at Serdang that the litters of pure bred Middle White sows average about ten, of which about eight are reared. The Large Black breed is more prolific and they rear 8 to 10 pigs per litter. In respect of porlificacy normal animals of both breeds retain the characteristics they exhibit in temperate climates.

The Boar.

The custom of local breeders of using immature boars and moving them from one holding to another has been mentioned, and the fear of handling mature boars no doubt has played a great part in the establishment of this custom. It must be appreciated in this respect that the Chinses pigs are not so docile generally as pigs of the European breeds.

Selection for Stud Purposes.

Insufficient care is usually taken in selecting the boar. The Chinese apparently believe in the old adage that most of the breed is transmitted through the feeding trough. The modern thought on the subject of heredity that the male is far more than half of the herd, should be acknowledged. The male invariably transmits more of his characters to the offspring than does the female and for this reason it is essential that boars for stud purposes should be carefully chosen.

In selecting a boar it is advisable to know the mother and her degree of productiveness, whether she produces even litters of good pigs, as opposed to the sow having one or two outstanding pigs in an otherwise poor litter. The strain of pigs should be docile, true to type and vigorously healthy. The young boar should be selected when he is a weaner, so that one of the most vigorous pigs in the litter can be chosen. Many breeders would discard an otherwise good weaner boar if he did not possess twelve to fourteen rudimentary teats.

Care of the Stud Boar.

Young boars should be segregated from the herd. They require plenty of exercise, preferably on a grass run, they must have a dry bed, and a daily bath. A diet of nutritious vegetable foods supplemented by concentrated meals, is required to keep them in a thriving condition and they should not be allowed to become too fat.

The boar may be used for breeding between the age of eight to nine months to 5 or 6 years old but he should not be used too frequently.

The Chinese custom is to use one boar to about 120 sows and the service fee is $1 per sow. The boar is allowed to serve about 20 sows per month, which is heavy duty; on these figures the boar keeper obtains an income of about $20 per month.

The boar's ration is about 3 kati (4 lbs.) of boiled rice per day with sweet potatoes or other vegetable food, supplemented with 2 or 3 duck or fowl eggs daily.

The use of the usual type of poor, immature, undersized native boars is to be deprecated. Such stud stock must have a tendency to lower the quality of the pigs in successive generations.

Pure bred boars of good type European breeds are strongly recommended.

Cross Breeding.

It has been observed in cross breeding experiments at Serdang that when Chinese sows are crossed with boars of the Large Black and Middle White breeds a remarkable improvement in comparison with the sows has been obtained even in the first generation. In size, conformation, and vigour, the litters have almost invariably the characteristics of the boar, even to colour in the case of each breed; the hollow backs and flat pasterns are absent. It must, however, be acknowledged that the young animals are well fed and receive minerals in their rations.

Similar success has been achieved in the use of the Poland China breed crossed with native sows, at the Central Mental Hospital, Tanjong Rambutan, but at this Institution the same breed of boar was subsequently used on half and quarter bred sows with no outstanding reversion, even in isolated individuals, to the type of the local pig. The offspring in succeeding generations more strongly resembled the Poland China breed.

The same results have occurred at the farm of the Singapore Cold Storage Co. at Singapore when using boars of the Large White breed. The policy adopted by this company is to use this breed for cross-breeding and intermittently every few generations use a good type, cross bred boar to infuse once more the characteristics of the local breed into the herd.

It is not considered that the use of a boar of the Chinese breed crossed with European sows would produce the same improvement in type of the offspring, owing to the prepotency of the male in the breeding of farm animals.

The native pigs are eminently suited to the country and the Chinese methods of feeding. The practice of continually mating pure boars of a European breed with the cross bred progeny would in a few generations produce a type of pig practically identical with the breed of the boar, with the gradual extinction of those good characteristics of the Chinese breed which it is desirable to retain in the pigs in Malaya, and it would no doubt be advisable to use as a sire every third or fourth generation as previously mentioned, a good half bred boar to infuse again into the herd the characteristics of the Chinese pig.

It would no doubt be a better policy to improve by selection a good pure strain of the Chinese breed for the purpose of providing breeding stock for crossing with the European blood, but until such time as improved native stock is available, a cross bred boar having increased vigour, size, and a better conformation would be preferable to the animals that may be seen at stud in Malaya.

One of the best methods of importing pigs into Malaya is in the form of pregnant sows. The sow should have been pregnant for at least one month before shipping. In this way the sow and litter is landed at little, if any more cost than one mature pig of either sex, and the offspring have a better chance of becoming acclimatised by the time they mature and are less likely than older imported animals to suffer from the affects of the heat. The pigs of the litter that are not required should be saleable for stud purposes at prices nearly sufficient to cover the cost of the importation.

The difficulty of mating large boars with small sows which is bound to occur on the farm of the progressive breeder sooner or later, can be overcome by the use of a service crate, the principal function of which is to support the boar during the act of service.

Probably the best type of crate is about two feet wide and 4 to 5 feet long, open at one end with strong battens bolted along the sides at fairly close intervals with a space of about two inches between them, on which at a height just above the sows back can be placed loose cross boards to carry the boars' weight. These cross boards can be placed higher or lower according to the height of the sow.

Some Chinese Methods and Customs.

Chinese pig keepers market their animals at 8 to 10 months old at an average weight of 130 kati (about 173 lbs.) but the weights vary at this age from 75 to 175 kati (100 to 233 lbs.)

The maximum number of sows that a market gardener or small cultivator will keep is about seven. The work of attending to them is in addition to his routine work in the garden. He grows all his vegetable food for the pigs and purchases only rice, rice bran, and fish meal. A few pig keepers feed imported sago refuse.

The foods given to sows per day is composed of about 1 lb. rice bran supplemented with 20 lbs. of a mixture of tapioca roots and leaves, sweet potato haulms, and about ¼ lb. per head of fish meal. Sometimes the inside leaf sheaths of banana plants are used. The ration is boiled and given twice daily.

Suckling pigs are fed three times daily on boiled rice only. On approaching the age of about two months, boiled sweet potatoes and rice bran are added. Tapioca is fed only after the pigs are over 4 months old. At 5 to 6 months old the ration is similar to that fed to sows.

Water is thrown over the pigs always after feeding, that is, three times daily in the case of young pigs, and twice daily in the case of mature pigs. They do not, as a rule, have any other regular bath.

The simple operation of castration is usually performed by the breeders, but the spaying of sows, which is a common practice, is a more serious operation and an expert is employed for this work. His charges are about 20 cents per head. The operator is invariably proficient and there are seldom any serious effects on the spayed sows after the operation.

Housing.

The Chinese squatter usually builds a low, badly lighted shed, constructed of round jungle timber with "lalang" grass (*Imperata arundinaceae*) as a thatch; split slabs of timber are laid down for the floor, later he will put down a concrete floor connected by a drain to a small reservoir in which he collects the urine. His principal object in laying the concrete floor is probably to catch the drainage for use on his vegetable garden, the comfort of the pigs being a secondary consideration.

Pigs are most susceptible to damp sleeping quarters and to maintain them in health it is essential that they be provided with a dry bed.

The animals should not be overcrowded. Sufficient space is necessary for free movement, otherwise they will foul their own bed. Ordinarily, they are not dirty animals and provided the styes are regularly cleaned, they will develop clean habits.

Temporary sheds are not recommended as they are difficult to keep hygienic; such houses are, however, often necessary owing to lack of capital.

Roomy, rain proof, well-ventilated and lighted sheds, preferably of iron and concrete, are advocated as soon as circumstances permit; cracks and crevices in the walls and floors harbour dirt and parasites.

Suitable pens for store pigs are about 10 feet by 7 feet. Farrowing pens should be larger and 10 feet by 15 feet or slightly smaller are convenient dimensions. Some breeders prefer to have a shed containing a single row of pens; they maintain that ventilation is better and supervision is more thorough, since an attendent will normally only traverse each shed once during his round of inspection. Houses with a central passage and a double range of pens are cheaper to construct for a given number of livestock, and are in many respects ideal.

The floors should be of concrete with a portion of each pen raised about 2—3 inches on which the pigs can make their bed. Bedding or dried grass or such similar material is necessary as it is inadvisable for pigs to lie on cold damp concrete.

A layer of asphalt laid in the concrete about 2—3 inches below the surface is sometimes recommended to prevent the moisture from below coming through the floor. Floors should have a gentle slope to one side of the building, a fall of one inch to ten feet being suitable, so that all liquid manure will flow away to the drains.

If the feed troughs are arranged along the passage running through the centre of the shed and the sleeping quarters are along the outsides of the building. then the slope can be made towards the feed passage and a narrow open drain along each side of the feed passage should be constructed. It is preferable, if it can be arranged, to put the trough adjacent to the floor on the high level, as the pigs will usually defecate at the lowest floor level.

The drains should be of the open type. Underground drains are liable to get choked, the outlet drain should have, at a small distance from the building, a bye-pass leading into a urine tank so that when washing down the pens, the water may be allowed to flow away. Alternatively, a stop can be put into the drain to cause the liquid manure to flow into the tank. It is advisable to empty this tank daily. Outside rain water drains should be separate from the inside drainage system.

All floors should be roughened by brushing the top rendering of concrete with a stiff broom just before the cement has hardened. In this manner, a close grained finish can be made which is neither slippery nor porous; in addition,

it is recommended that the surface be marked by crossed grooves about half an inch deep and spaced about 6 inches apart to form parallelograms. Such grooves should be constructed along the slope of the floor so that they conduct the water to the main drains.

The roof may be constructed of asbestos cement sheets or corrugated iron; attaps or thatch are no doubt cheaper and cooler, but for hygienic reasons one of the former is preferred. The sides of the building and the end least exposed to the weather may be open, or closed with expanded metal only. A liberal overhang of the roofing sheets is recommended.

Feeding troughs may be made of concrete, finished with a fine polished rendering; half section glazed tiles, white, or brown, embedded in a concrete base, are however better. Troughs should be fastened down so that the animals cannot move them about. The best type are constructed of cast iron set in the walls of the feeding passage with a swing door above them, hinged at the top horizontal edge so that it will shut and fasten to both sides of the trough. With such an arrangement, the pigs can be shut away whilst the food is being poured into the trough or it is being cleaned. This type is installed in the piggery at the Government Experimental Plantation, Serdang. The above-described type could be constructed locally of hard wood.

Shade, which is necessary in the open runs, can be provided by the planting on the outside of the fences, but adjacent to them, the West Indian Cherry tree (*Muntingia calabura*), or other suitable trees; trees planted inside the pens must be protected even after they are full grown to prevent the pigs from eating the bark and so killing the trees. All pig styes should be periodically lime washed; the addition of about 1 lb. of bleaching powder to a bucket of lime wash will aid in the destruction of parasites.

Feeding.

Pigs, having a comparatively small stomach, require easily digested foods; large amounts of fibrous bulky foods are unsuitable. They nevertheless require a certain amount of succulent food in the form of vegetables or grasses.

Guinea grasses (*Panicum maximum*) or other fodder grasses, if cut at intervals of about two to three weeks, make excellent fodder. Grasses are greatly relished by animals of all ages.

The vegetable foods used by the Chinese are sweet potato haulms and tubers, tapioca leaves and tubers, Keladi (*Colocasia sp.*) tubers and leaves, the white inside leaf sheaths of bananas, and swamp land 'kankong' *Ipomea reptans*. Yams (Dioscorea sp.) are being used more than formerly.

These foods are boiled as it is considered that cooked vegetables are safer to feed and are less liable to cause digestive troubles. Boiling is a well-established custom although it is a well known fact that cooking destroys certain food constitutents, impairs digestion to some extent and is expensive. It is not recommended without more evidence, that such foods be given in the raw state.

Some breeders purchase tapioca refuse and imported sago refuse and use it to replace part of the usual vegetable diet.

Concentrated Foods

The concentrated foods principally used by the native breeders are rice bran, and broken rice; the latter is also cooked and forms the basic diet for weaners. A small amount of fish meal is given in the rations of pigs after they are a few months old. Tapioca is not included in the ration until the animals are about four months old.

There is no reason why other concentrates obtainable in Malaya should not be fed to swine, and a study of their values compared with market prices would enable the progressive breeder to obtain the greatest amount of nutrients for the expenditure on food.

A mixed diet is always preferable to one composed of one particular meal. The body can obtain its requirements more easily from a mixture; some meals are deficient in minerals, others have an influence on the carcase, for instance, a diet of maize will produce a soft yellow fat; beans, peas and probably the Indian grams produce a hard stringy pork if fed in excess.

The nutritive ratio is easier to balance with a ration composed of mixed meals, and it has been found in practice that the feeding of mixtures is more economical. Animals will gain weight faster if fed on a mixed ration, even if the calculated value of the mixture is apparently identical to that of a ration composed of a one kind of grain.

The following concentrated foods are recommended for pigs in Malaya; maize, soya beans and cake, rice bran, broken rice, gingelly cake, coconut cake, sago and tapioca refuse, Indian grams and other pulse.

It is not proposed to lay down any hard and fast rules regarding rations, as the economical feeding of pigs depends on the supply of cheap starchy foods augmented with the cheapest suitable concentrated albuminoid food procurable.

The nutritive ration mentioned earlier, is the amount of digestible protein compared with the total of the digestible fats, starches and sugars.

Young pigs require for their successful growth a ration of 1 of protein to about 4 of non-proteins which may be widened as the pigs become older. When they are being fattened a ratio of 1 :6 or 6.5 is the most economical to feed. Breeding sows fare best on a ratio of about 1 to 5.

The practical application of the foregoing in the case of young pigs over 4 months old is to feed those constituents rich in carbohydrates such as tapioca and sweet potatoes cooked and mixed at the rate of about three pounds per day with one to two pounds of meals or cakes composed of soya bean, coconut cake, rice bran, and gram or gingelly cake, if the last two are not too expensive, with an allowance of fresh grass cut daily or grazed ad lib.

In the absence of milk, cooked broken rice and a little rice bran with fresh cut or grazed grass is probably the best ration for weaners. It might be mentioned here that rice is used in some countries as a corrective for diarrhoea in young pigs.

Breeding sows and boars may be given per day about 10 lbs. of vegetables and 1—2 lbs. of concentrated foods with grass or grazing ad lib.

Fattening pigs can be fed on a ration consisting 3—4 lbs. of a mixture of concentrated foods, with grass, and 10 lbs. to 12 lbs. of vegetables.

Grass cut at intervals of about three weeks has a well balanced ratio of proteins and non-proteins, and if fed in lieu of sweet potatoes, sago or tapioca, would cause small requirements of highly concentrated protein foods. Broken rice, rice bran, and maize, if reasonably cheap, could be substituted for the above-mentioned cakes and meals.

As sweet potato and tapioca tubers can now be purchased, delivered at about $1 Straits (2s. 4d.) per picul (133⅓ lbs.) the ration should, in the absence of home-grown foods, for economical reasons be made up to include these foods.

Foods should be given in a fairly dry state, but wet enough to eliminate waste. Fresh water should always be available for the animals. Weaners should be fed three times daily; pigs from 3 to 4 months old may be fed twice per day, but the hours of feeding should be regular.

It is generally considered that soaking concentrated foods for a few hours before feeding is better than boiling. Care must be taken that such food does not become sour. Only sufficient food should be given that the animals will eat in one meal. If it is left to go sour in the feeding trough, it becomes stale and unpalatable and causes the animals to go off their feed. Changes in the diet should be effected gradually otherwise there is a danger of causing digestive troubles.

The feeding troughs of tropical pigs in small pens should be cleaned after meals and filled with clean water, and it is desirable that animals in open yards or grazing areas have access to running water.

Grass may be cut at intervals of about two to three weeks. At this stage the fibre content is low and the protein is high. Some tropical grasses if they are cut and fed at shorter intervals contain certain poisonous properties and may cause some derangement of the digestive system with diarrhoea.

Uncooked tapioca roots should be fed soon after they are harvested as chemical changes take place in the outside coat and poisons are produced. Such poisons can be discarded by peeling the tubers; this, however, is not practicable.

The best method is probably to boil the roots immediately after lifting and not allow them to become stale before feeding. Excessive quantities of sweet potato vines also sometimes cause digestive troubles owing to the development in them of prussic acid in minute quantities.

The feeding of small quantities of very soft charcoal has a beneficial effect on the digestive systems of pigs kept in small pens.

Minerals.

It has become the practice during recent years to feed a proportion of minerals with the ration, the usual amount given is at the rate of 2 per cent. of the concentrates fed.

It is considered that the hollow backs and flat pasterns of native pigs may probably be attributed to the lack of mineral salts in the system. The eating

of earth by pen-fed animals when given range, can be attributed to their craving for mineral salts, probably phosphates and calcium.

The feeding of fish meal will overcome mineral deficiency to a large extent, but the best method of supplying sufficient minerals is by the application of chemical fertilizers on vegetable and grassed areas that are destined to provide the bulky food for the pigs. Such minerals that have been taken up by plants are in a more easily assimilable form than is the raw chemical fed in the daily ration.

A certain amount of mineral matter is necessary for the proper metabolism of the body, and comparatively large quantities are required by sows for the production of young and milk. If the ration contains insufficient quantities for the production of milk for the young, the sow will maintain the correct quantity in the milk she secretes, by drawing from the mineral resources of her own body leaving her own system deficient in inorganic matter. This probably is one reason why some breeders advocate the production of three litters in two years, as incorrect feeding makes it imperative that the sows be allowed a resting period to enable them to lay in a further store of mineral salts. It is known that animals can store minerals in their bodies and give up large quantities to their young when necessary, but such methods of feeding which call for suckling mothers to draw on their resources are not conducive to the best results, and it has been found in experiments that the feeding of sufficient mineral matter to all classes of animals increases the rate of growth and flow of milk considerably, and aids digestion, enabling them to obtain more nutriment from the food consumed.

Many proprietory mineral mixtures are on the market.

A home-made mixture can be made which is usually much cheaper than the proprietory article; a suitable one is as follows:—

Common salt	35	parts
Steamed bone flour	30	,,
Wood ashes	15	,,
Lime air slaked	10	,,
Iron sulphate	1	,,
Flours of sulphur	5	,,
Magnesium sulphate	3.7	,,
Potassium iodide	.3	,,
	100.00	,,

It is essential that the steamed bone flour be thoroughly sterilized, otherwise there is a danger of introducing anthrax.

REPORT OF THE NINTH INTERNATIONAL DAIRY CONGRESS 1931.

BY

E. A. CURTLER,

Assistant Agriculturist.

The writer of this report was selected as one of the delegates to represent the Governments of the Straits Settlements and Federated Malay States at the Ninth International Dairy Congress.

The Congress was held in Copenhagen from the 14th. to 17th. of July, 1931, all sectional meetings of the delegates taking place in the Christiansborg Castle, which is the Danish Houses of Parliament. The offices of the Congress were also in the same building. The delegates were accommodated in the hostels and pensions in the city.

Previous congresses had been held in various European capitals biennially commencing in 1903, with a break from 1914 to 1926, but during this interim a congress was held in the United States of America under the auspices of the "World's Dairy Congress Association", taking place in 1923. The next Congress will probably be held in Germany during 1933.

At the Copenhagen congress, forty-two countries were represented and of these thirty-two governments had sent official delegations. The largest delegation was from the United States of America and comprised ten members, then Germany and Belgium with nine each, while thirteen countries only sent one delegate. The total number of delegates attending the congress was just under seventeen hundred, of whom about two hundred were ladies accompanying active delegates.

The delegates represented a large variety of occupations including members of the research and teaching institutions of agriculture, veterinary and health officers, farmers, wholesale and retail milk dealers, representatives of firms making milk foods and chocolate, agricultural engineers, importers and exporters of dairy produce, also the press connected with the dairy industry.

The congress was divided into five sections which dealt with—

(i) Dairy cattle breeding and milk production.
(ii) Chemistry, bacteriology and hygiene.
(iii) Technique, industry and trade.
(iv) Organization, legislation and control.
(v) Tropical dairy industry.

The sections met concurrently in different rooms with the exceptions of section (iv) which only met on the first three days of the Congress and section five which occupied section four's room on the last day of the Congress.

Inaugural Meeting.

The inauguration of the Congress took place in the Town Hall, Copenhagen at 4 p.m. on Monday 13th July. 1931. The delegates were welcomed by Mr. S. Overgaard, President of the Congress and Chairman of the Danish Section of the International Dairy Federation. During the course of his remarks he pointed out that Denmark took a particular interest in the dairy industry as that small country produces one-third of the butter exported in the world.

The President was followed by the Hon'ble President, Mr. K. Bording, the Danish Minister of Agriculture, who welcomed the delegates on behalf of the Danish Government. He stressed the value of the personal efforts of the Danish farmers, the government educational and advisory services, the co-operation between government and the agriculturists also the government control of the quality of the produce, in the maintenance of Danish agriculture. He pointed out that Denmark has the greatest agricultural turnover per head of any country in the world. In conclusion, he mentioned the value of international co-operation. Having thanked His Majesty the King of Denmark for his presence, he wished him a long and happy reign.

The congress was then officially declared open by His Majesty the King of Denmark.

Danish Agriculture.

Mr. Madsen-Mygdal, late Danish Minister of Agriculture, then delivered the inaugural lecture on the development of Danish Agriculture. He pointed out that in Denmark, farming and dairy farming are synonymous, as every farmer is a dairy farmer. He stated that the principal products are butter and bacon, which are not surpassed in quality by any country in the world. These products play a great part in the foreign trade of Denmark, as they, with the minor agricultural products, represent 77 per cent. of her export trade. The export of animal products is actually greater than from any other country in the world. He next mentioned that there are 42 cows and 148 pigs per 100 inhabitants. To feed this great number of live stock, 15 per cent. of the land is cultivated for roots and there is a large import of oil cakes.

This intensive animal husbandry has only developed during the last half century, since cheap American corn came on the European market.

He mentioned that the majority of Danish farmers are freeholders, hence the large amount of capital invested on the land and the intense interest taken by the farmers. This is helped by the Co-operative Societies, which provide most of the initial capital, so that the farmer has his own money available to make improvements.

The holdings in Denmark are mostly small, so the owner is able to give personal attention to detail.

During the last thirty years 18,000 small holdings have been established with government assistance, while 120,000 have been established by purely private enterprise.

Owing to the system of co-operative dairies, these small-holders produce a uniform product. The success of these small holdings has been aided by the training of the young farmers in agricultural schools.

The concluding speaker was the Italian Minister of Agriculture, H. E. Baron Giacomo who spoke of the value of dairy farming to a country.

Tropical Dairy Industry Section.

Section V, Tropical Dairy Industry did not meet till Friday the 17th July, which was a great disadvantage as one did not have an opportunity of making the acquaintance of the other delegates from the tropics till that day, except by chance.

Mr. J. F. Blackshaw, Dairy Commissioner of the Ministry of Agriculture, London, was elected chairman of the section.

The six papers read before the section were:—

(1) "The genetical improvement of cattle in the tropics" by A. D. Buchanan Smith, University of Edinburgh, Animal Breeding Research Department.

(2) "Dairying in the Dutch East Indies" by J. L. van Ech, Director of the Civil Veterinary Service.

(3) "The possibilities from an extended dairy industry in the tropics, especially respecting experiences obtained in Kenya Colony" by Th. Fjord Jensen, Manager, Kenya Co-operative Creamery Ltd., Naivasha.

(4) "Problems of tropical dairying" by John Hammond, School of Agriculture, Cambridge.

5 "Milk production in India" by Zal R. Kothavala, Assistant Imperial Dairy Expert, India.

(6) "On dairy farming in Formosa" by Masayoshi Sato, Professor, Hokkaido Imperial University, Sapporo, Japan.

It will be noted that four of these papers describe the conditions obtaining in various parts of the tropics, while the other two are written by workers at research stations in Great Britain, but Hammond's paper was written after a short visit to the West Indies.

Dairying in Netherlands India.

Mr. J. L. Van Eck's paper was a description of the position in the Dutch East Indies at the moment and was illustrated by a number of lantern slides. The conditions are similar to those in the Malay Peninsula, in that the major portion of the dairy products consumed in the country are imported. There is one great difference, a small amount of butter being made in dairies situated in the higher elevations.

There is a large import of preserved milk, but it is possible that this will decrease in the future owing to the increase in the number of dairies in Java.

Dairy Farming in Kenya.

Mr. Th. Fjord Jensen first stressed that it was refrigerators that made world-wide trade in dairy products possible. He remarked that by the use of refri-

gerators the tropics might participate in the production of goods for this trade.

His experience was obtained in the Highlands of Kenya, which are about 9,000 feet above sea level.

The cow kept by the native is the Zebu, which produces a small quantity of milk of good quality. Attempts have been made to improve the yield by crossing the Zebu with European cattle, usually the Friesian.

The bulk of the food for the cattle is the natural grasses, which are supplemented by a ration of concentrated foods and lucerne.

Disease is a serious obstacle to the development of cattle rearing in Kenya.

The cream, which is separated from the milk in centrifuges, is sent to the dairies, as far as 25 miles by road and then from 50 to 125 miles by rail.

Six years ago the government put a prohibitive tariff on butter, which has caused the production of milk in the country to be rather more than doubled. The tariff also resulted in the opening of three dairies which have recently merged into one company owned by the farmers.

A small export trade to London has now been established, and is increasing.

The dairy industry at present is all in the hands of Europeans who own about two and a half million acres of land suitable for the extension of dairy farming.

Formosan Dairy Farming.

Prof. Marasyoshi Sato briefly described the position and topography of the sub-tropical island of Formosa.

Dairying was first introduced with the commencement of the Formosa Government and advanced owing to the demand from the Japanese settlers.

Native cattle were first used, then Shorthorn and Ayrshire stock was introduced. Holsteins were imported at a later date and signs of their blood are visible in most of the cattle now seen in the island.

Owing to the European breeds being frequently attacked by piroplasmosis, some stock of an Indian breed were introduced. These were resistent to piroplasmosis but only gave a small quantity of milk which was, however, of good quality.

The present policy appears to be to select the best Indian cows and cross them with Holstein bulls.

Dairying in India.

Zal R. Kothavala first pointed out that the dairy problem in India is unique, in that the agriculturists are all poor men with small holdings, who have to use the same cattle for draft and milk production. The problem is further complicated by religious beliefs of a large section of the population, who object to any cattle being slaughtered or any male castrated. This results in many old and useless cattle being kept alive, also in the presence of undesirable sires.

The principal breeds of Indian cattle and buffaloes were then given.

The main problem in India to-day is to select from the existing breeds a "dual purpose" animal, that is, one which will produce a strong fast walking

male for draft purposes and a female that will give a satisfactory yield of milk.

To-day there is no dairy industry in India in the sense that is meant in Europe.

In the villages, where 95 per cent. of the population reside, each cultivator has on the average one cow and one buffalo. The former produces his working animals and the latter his milk. The milk is usually consumed by the cultivator and his household, either raw or made into butter or "ghee".

In a few cases dairies have been established, which manufacture butter from the cream and casein from the skim milk.

In the town the milk supply is produced by animals kept and fed in the urban area. The supply is usually produced under insanitary conditions and is not sufficient to meet the demand.

Indian Dairy Problems.

What is required is a system whereby the milk can be produced in the rural areas and transported to the towns. The problems affecting milk production in India were next discussed, these are :—

(i) Dairy education. The lack of trained men was severely felt in the past. Since the war an Imperial Institute of Animal Husbandry has been opened in Bangalore. This is supplemented by other institutions run by most of the provincial governments.

(ii) Breeding. The native cow is not profitable. It is late maturing, an irregular breeder and a poor yielder. The crossing of indigenous cattle with European dairy breeds was tried. The first cross gave excellent results, but subsequent generations could not stand the rigorous conditions in the villages. Pure line selection has therefore been substituted, with the result that selected heifers now produce their first calf at three instead of five years of age, the regularity of calving has been greatly improved and an average annual yield of 5,000 lbs. of milk per cow in a herd has been established, whereas the normal yield is only 1,000 lbs.

(iii) Feeding. Cows are usually grazed on common pastures or in forests where they do not obtain sufficient food, except during the monsoon. Storage of grasses and fodder crops in pit silos has been found successful.

Stall feeding has been found to be the most profitable system.

(iv). Disease control. An efficient control of "rinderpest" is reported. Research work is being carried on at the Imperial Veterinary Research Institute.

(v) Rearing. In-calf cows were usually left to get what food they could in the grazing areas. The calf was reared on the milk left by the milkers, an uncertain quantity. Cultivators are now being educated in the value of the proper feeding of the in-calf cow and of feeding the calf from a pail almost from birth.

(vi) Housing. In the sense used in Europe is not practised.

(vii) Production and handling of milk. This is the most difficult problem, in view of the temperature, dust and careless methods of the workmen. Pasteurising is being practised in the government institutions.

(viii) Transport of milk. Owing to lack of demand, no insulated trucks are available on the railways. Pasteurised milk in cans, insulated with wet straw and sacking, has been sent over 500 miles in parcel vans and after being pasteurised a second time at the end of the journey, it has kept for eight hours.

(ix) Retail distribution of milk. Capped and sealed bottles are being rapidly adopted in the big cities.

In reply to several questions at the conclusion of his paper Mr. Kothavala was emphatic that the better method of improving the cattle in India was by pure line selection, not by the importation of stock from other countries.

Genetical Improvement of Cattle in the Tropics.

In the unfortunate absence of A. D. Buchanan Smith his paper was read by one of his assistants. The paper consists of a discussion of the principles involved in the improvement of stock in the tropics.

The two usual methods of improving stock in the tropics are by the importation of cattle having the desired qualities or by selecting out the desirable specimens from the indigenous cattle.

The necessity for considering disease resistance and nutrition were next pointed out.

The primary functions of cattle were enumerated—

(i) Milk.
(ii) Meat.
(iii) Draft.

The secondary functions as—

(i) Hides.
(ii) Bones.
(iii) Creation of dung.
(iv) As a sign of wealth, especially for dowry.
(v) Religious purposes.

The points to be considered before dealing with the problem of improvement are—

(i) Number and type of existing cattle.
(ii) The existing market for such stocks.
(iii) The potential market.
(iv) The existing methods of husbandry.
(v) Whether the existing methods are to be slowly improved or a radical change made.
(vi) Is disease efficiently controlled and can it be in the future?

The four methods of improving stock are—

(i) Elimination and replacement by imported breeds.

(ii) To grade up native stock to the improved standard required.

(iii) To infuse certain desirable characters into the native cattle, without loosing their chief characteristics.

(iv) By selective breeding of the native stock.

(i) This requires one of two conditions, either the environment or the husbandry should be similar to the country to which the cattle are to be imported.

(ii) Similar to (i) and only likely to be successful in countries with different climatic conditions, if, both nutrition and methods of husbandry can be made similar to those operating in the country from which the stock, used in the grading up process, is imported.

(iii) Only useful when the existing stock does not provide the local market requirements, or to introduce disease resistance.

(iv) This system allows the improvements in the methods of husbandry to be made, at the same time as the class of the stock is being improved.

"As a general rule, experience is showing that the development of the potentialities of the native races is the best method to follow in the majority of tropical countries."

From the sentence above it will be seen that Mr. Buchanan Smith is in full agreement with the policy of the Indian Dairy Expert on the question of the best method of improving the cattle in a tropical country.

Problems of Tropical Dairying.

John Hammond's paper is a survey of the problems of tropical dairying, based on a short visit to the West Indies.*

In a discussion on the question of feeding, he points out that in England the highest yield of milk is obtained in the spring when all the grass is young. A similar condition operates in the West Indies, where the highest yields are obtained in the wet season, again when all the grass is young. He suggests that the milk yield might be maintained during the dry season, by feeding ensilage made during the wet season.

During a short discussion on management he mentioned that grazing in paddocks shaded by Rain Tree (*Pithecolobium Saman*) gave excellent results, the paddocks being well watered and grazed in rotation.

He mentions three methods of improving the native cattle :—

(i) By selection.

(ii) Grading up native stock with imported cattle.

(iii) Breeding crosses of native and European cattle.

(i) He emphasises that this method is slow. He also points out the practical difficulties of training the cows to give down their milk when not being suckled.

(ii) Experience has shown that "grade" cattle tend to suffer from constitutional disabilities in the same way as pure bred European cattle. Of the breeds tried Shorthorn and Ayrshires have been the least satisfactory, while Friesian, Jersey and Red Poll have been more adaptable. This method is not considered to produce a solution to the problem of breeding up cattle in the tropics.

* The paper is reproduced in full in another section of this number of the M.A.J.—*Ed.*

(iii) Crosses have been produced with the constitution of the native cattle and the udder development of the European cattle.

Such points as colour and horns segregate sharply among the progeny of inter-bred first crosses, but points as body form and milk yield segregate about a mean so that it might be possible to produce a new breed with a higher milk yield, suitable for tropical conditions. To achieve this only one breed of native cattle and one of imported cattle would have to be used. It would also be necessary to have a number of herds to prevent excessive in-breeding.

Discussing the question of marketing he records that the use of cold stores and ice makes the milk too expensive for the majority of the native population. He suggests that pasteurisation and bottling would be a cheaper method of ensuring a safe milk supply.

Summary of Papers.

The papers dealt mainly with the problems to be met with in tropical dairying. It is only in India that the work has been going on long enough for any conclusions to be reached.

The main agricultural problems are :—

(A) The breeding of a type of cattle which has a profitable output of milk and is at the same time resistent to tropical diseases.

(B) Secondly, to grow such crops as will economically maintain the full milk yield of the cows.

(C) Another problem, which is partly agricultural, is the packing and transport of milk from the dairies to the urban population.

(A) Selection of suitable cattle. The two most usual methods are — (i) Importation of high yielding cattle from temperate countries and (ii) grading up, by selection, of indigenous cattle.

(i) This method has been tried with varying success in all the countries reported on. In India it is not considered satisfactory, but the preliminary work in the West Indies indicates that it shows promise in that area.

(ii) This slower method has only been systematically tried in India, where the results are satisfactory. The weight of opinion appeared to be in favour of this method.

(B) The growing of special crops for fodder was not considered. The advantage of making young grass into silage as against allowing the grass to grow old and fibrous was reported.

(C) The use of refrigerating vans or ice, for the transport of milk, makes it too expensive for the majority of the population. Pasteurisation and dispatch in sealed bottle is suggested as a more economical method.

Danish National Dairy Exhibition.

The main feature of the exhibition was the collection of samples of butter and cheese which had been submitted for competition. The exhibits of butter, which numbered 1,400 barrels, were all displayed in a refrigerated enclosure, with glass windows. In front of each barrel was a sample from which visitors

could take small portions to taste. The evenness and high quality of these samples was very noticeable and it required a trained palate to differentiate between them.

The remainder of the show was taken up with exhibits of the various makes of Danish agricultural machinery. One striking feature was the number of refrigerating plants to be seen. Some of these were worked by ammonia and others by carbonic acid. The plants were exhibited in all sizes. These appear to be more used in the inland continental countries, where the climatic conditions are more extreme than in England. Owing to the long coast line of Denmark, that country is warmer on the average than other countries in the same degree of latitude. The winters, however, are long, from 7 to 8 months, so that at the most there are only five summer months.

Practically every machine which was used for measuring or manufacturing a product, was fitted with a sloping bracket. These were fixed at a comfortable height for writing and in such a position that the operator could conveniently read the dial on the machine and then write down his record; a point which must both facilitate the recording and tend to render it more accurate.

On the stalls devoted to the exhibition of milk containers, the general use of aluminium was very noticeable. In almost all cases this metal was used for milk churns, usually for milking buckets and other small vessels as well. The churns are seamless and hard rolled. The advantages of having a rustless metal are numerous. One firm exhibited a churn fitted with an ice container in the neck.

The bottles used for the retail distribution of milk all had much smaller necks than those customarily seen in England or Malaya, the size at the top being smaller than a one cent piece. In place of the pressed-in parchment seal, metal crown covers were generally used.

One firm exhibited flasks fitted with special stoppers that automatically measured off the amount of sulphuric acid and amyl alcohol required for the Gerber's method of testing the butter fats in milk samples.

The machine for weighing eggs was similar to those seen in England in that each egg was fed from a travelling band on to a revolving table, from which the heaviest eggs were thrown out by the first balance and the lighter ones in rotation. It was, however, claimed that the machine there damaged less eggs than any other that is being manufactured at present.

A number of different types of pasteurising machines were also exhibited, which was to be expected as practically all the milk in Denmark is treated in this way before consumption.

Other machines seen were churns, butter workers, separators, washing, bottling and corking machines.

Selected Article.

TROPICAL DAIRYING PROBLEMS*

Feeding Problems.

Things which have a seasonal distribution have also a geographic range, and an interesting comparison can be made between the seasonal variation and geographic differences in milk yields. Sanders has investigated the seasonal variation in the yields of cows in two different districts in England, which show that on the average in commercial herds, the yield rises at the time the grass begins to grow in the Spring and falls again as the hot weather begins and the grass matures and becomes fibrous. Woodman's work on the composition of grass has shown that in the early stages of growth it is a concentrated food (plus water) and that its high protein content, high digestibility and low fibre content makes it a very suitable food for milk production purposes. As the grass gets older, however, and especially after the flowering shoots appear, lignified fibre is formed, the proportion of protein and the digestibility fall and the bulkness is increased. Thus even in England where the supply of concentrated foods is abundant, commercial herbs on the average show well-marked seasonal changes due to the type of roughages fed, for a large proportion of the cow's food intake in commercial production always consists of home-grown forages or grazing. High producing animals have not the capacity to hold the bulk of food required to supply sufficient nourishment to support high yields where the feeding stuffs are of low quality and contain much fibre; this is the main cause for low yields under commercial conditions.

The seasonal variation in the milk yields will then give a measure of the feeding value for milk production of the forages used during the different months of the year. These have been calculated from milk records obtained under tropical conditions in Jamaica and Trinidad: the yields of milk are low during the "dry season" (December to March) and rise with the onset of the "wet season", but begin to fall again before the end of the wet season. A comparison with the seasonal variations in England shows that the primary influence is, as stated above, the amount and quality of the grasses and forages for a comparison with rainfalls and temperatures shows that, while in the Temperate Zone the growth of grass in the Winter months is limited by temperature and begins as this rises in the Spring (rather earlier in the South-Norfolk, than in the North-Cumberland), in the Tropics the growth of grass is limited by rainfall and begins with the onset of the wet season, and is reduced during any intervening short dry period.

That these seasonal differences in milk yields are due to the effects of climate on the plant and so on the nutrition of the cow (in addition to any direct action the temperature or rainfall may have on the animal) is also shown by the fact

* By John Hammond in *Tropical Agriculture* Vol. VIII, No. 12, December, 1931.

that in Jamaica during wet "dry seasons" (1925, 1927) the yields are much above those in dry "dry seasons" (1926, 1928).

Thus the main problem of feeding in the Tropics would appear to be the supply of high protein, low fibre and if possible, succulent foods during the dry season. Ensilage of grass or forage crops in the early stages of growth in either the tower or pit silo, or irrigation of pastures are methods which are being used with success. Forages on the whole in the Tropics, like those in England during the hot weather, soon develop fibre and become bulky and unsuited for milk production. Much variation exists, however, among the different grasses and there is much scope for the selection of low fibre and high protein species. Digestibility trials of those in common use, are also now being made at the Imperial College of Tropical Agriculture in Trinidad. In the Temperate Zones, the deep rooting and high protein leguminous plants such as lucerne and white clover supply a high protein feed during the Summer months and these not only supply suitable food for growing and milking animals but also raise the fertility of the soil by fixing nitrogen. At present no such leguminous crops are cultivated in the West Indies, and the discovery and use of such would do much to improve cattle production in the Tropics.

While deficiencies of home-grown forage crops for high milk production can be made up in European countries by the use of the comparatively abundant bye-products of industrial manufacture (oil cakes, meals etc.) and in Temperate Zone by the rotational cereal (oats) and pulse (bean) crops grown, these products are difficult to obtain and are expensive in the Tropics. The local production of coconut meal may in the future supply such a product, but the prevailing tendency in the West Indies for the cultivation of trees and perennial crops to the exclusion of annual crops (which is encouraged by the nature of the climate) will always limit the local supply of concentrated feeding stuffs of this nature and render their importation necessary for high production. One of the functions of the animal in agriculture is to form a means of cashing those crops, or bye-products of crops, which are not fitted for human consumption direct. Of the staple crops which are grown in the West Indies, the sugar cane is almost the only one which supplies such bye-products suitable for feeding cows: the tops in the cutting season and the mollasses form useful feeding stuffs and a variety called Uba cane which produces an abundance of leafy growth, is particularly valuable for this purpose. A peak in the milk production curve about February in Trinidad is probably due to the use of these fresh cane tops during the cutting season. It is necessary that improvements in feeding should go hand in hand with breeding, for unless this is done the nutrition will either limit the yield of cows with high milk capabilities or undermine their constitution so that they die at an early age.

Management.

The problems of management vary greatly in different districts according to the availability of pasturage, etc. and the details, although very important, can only in a few cases be drawn into general statements. Under natural condi-

tions cattle graze in the early morning and evening and lie in the shade during the middle of the day when the sun is hot. Housing during this part of the day not only falls in with this natural desire for shade but allows of the feeding of concentrates according to yield and may be used to increase the intake of water (by the addition of a little mollasses to it : and concentrates if in meal form may also be fed in this way). Provision of shade, and so the continuance of feeding throughout the day, is in some areas in Jamaica obtained by the use of the Peruvian rain tree (*Pithecolobium saman*) which allows grass to grow under it : a combination of these trees with small wired-in paddocks receiving water from neighbouring irrigated land and managed by a system of rotational grazing, appeared to give excellent results during the dry season.

Breeding.

Cattle in the Tropics have not been improved to the same extent for either milk or meat production as they have been in the Temperate Zone. From time to time importations of South America, European and Indian (Zebu) cattle have taken place and the present native stock, the survivors of these various importations, is very mixed. Various methods of improvement have been tried and the following are the main conclusions reached :

(a) *Selection of Native Stock.* This method is very slow. Great difficulty is experienced in breaking in the animals to be milked : having been used mainly for work purposes, they do not let down their milk unless a calf is being suckled or other means are taken and they frequently fail to breed again until the calf is weaned or the milk yield falls. Possible methods of overcoming this difficulty are the haltering of young stock to induce docility and the selection of sires from docile dams. The method of selection of this stock would, however, prove slow although not impossible.

(b) *Importation of European stock and grading up of native stock with these.* At first very good results were obtained by this process but just as it is found difficult to keep and breed pure European stock in the Tropics commercially because of a variety of causes which require further study and analysis (disease resistence, heat regulation, etc. but summarized as constitutional disabilities) so the stock which had been graded up by the use of European bulls for three or more generations fail to produce much milk and became degenerate. Table I for example, shows that in the Tropics a very well-bred Guernsey bull used on high grade European cows reduced rather than increased the milk yields.

TABLE I.

Progeny of Guernsey bull used on high grade European cows

Corrected Mature Milk Yields		Lb.
Average of 11 dams	...	5,200
Average of 11 daughters	...	4,800
		— 400

Of the various European breeds tried, the Shorthorn and Ayrshire appear to have a constitution least suited to the Tropics and signs of degeneration appeared at a lower concentration of their blood than those of other breeds (Friesian, Jersey, Red Poll) more adaptable to Tropical conditions. It would appear that a long thick coat and white skin are inimical characters in the Tropics. Periodic clipping is essential for the health of such animals. The methods of importing pure European stocks and the grading of native cattle to such stocks appear to offer no solution of the problem of breeding commercial dairy cattle in the Tropics.

(c) *European cattle—Zebu crosses.*—The Zebu has been very little improved for milk production and has a poor udder development, but it has a constitution eminently suited to the Tropics. On the other hand, European cattle have a well developed udder, but their constitution is unsuited to the Tropics and for this reason the body is not sufficiently vigorous under commercial conditions in the Tropics, to support the udder and high milk production. Crosses between the two types, however, have both constitution and udder development and so give better production particularly life production than the pure breeds. This is not merely a matter of hybrid vigour for different European breeds crossed together in the Tropics give no better results than those breeds when pure. On the other hand, it was surprising to find that the use of a pure Zebu bull on high grade European cows (although he came from a lower milk yielding strain) increased instead of lowered the yields. (See Table II).

TABLE II.

Progeny of Zebu (Montgomery) bull used on high grade European cows

Corrected Mature Milk Yields.		Lb.
Average of 10 dams	...	4,730
Average of 10 daughters	...	5,700
	+	970

It is believed that both constitution and udder development are multiple factor characters in inheritance and this being so it would follow that, cattle having many chromosomes, the inheritance of these characters is fairly accurately described by Galton's law of blending inheritance or percentages of blood. If this is so the first point to determine is what proportions of Zebu and European blood give the best results under any climate conditions. According to results obtained in Jamaica $\frac{1}{4}$ to $\frac{1}{8}$ of Zebu blood appears to give the best results. Conditions, here, however, are not so severe as may exist elsewhere in the Tropics, where a higher proportion of Zebu blood may be required. These results are taken from lactation periods in the years 1923-28 only and probably a more certain estimate of the proportion of Zebu blood best suited to commercial milk production would be obtained if the life production of the different grades were considered. As the proportion of European blood is increased from half to three

quarters and seven-eighths so the average lactation yield will go up, but the cows do not last so long in the herd and their life production becomes less. Promiscuous and repeated cross-breeding, however, does not lead anywhere, although the trial of the different European breeds has been necessary in the beginning to find out which were best. Once this is determined it is better to keep to one breed and its crosses with the Zebu and avoid that promiscuous mixing of breeds which leads only to mongrels.

Although the fancy points such as colour and horns segregate sharply when the first crosses are bred together there is every indication that the commercial qualities of constitution, body form and milk yield (which appear to be multiple factor characters) do not segregate sharply and only vary about a mean. If this mean produces a profitable commercial animal, the numbers to be weeded out will, therefore, be small, and there would appear to be no reason why a new breed of dairy cattle suited to the Tropics should not be produced by breeding together whichever grade of Zebu-European cross give the best results in a district. The Suffolk, Dorset Down and Corriedale breeds of sheep have been produced in this way.

The evolution of such a new breed could best be obtained by its being adopted on a large scale in a given area, so as to allow of interchange of blood between herds; and by the formation of a herd book which would act by segregating such animals from the common stock, a primary necessity in the creation of a new type. As with European cattle the chief difficulties would be met with the bulls; the cows could be selected on their milk yields but the bulls could only be selected by progeny tests.

Marketing.

The high temperature in the Tropics make this a troublesome matter; for without precautions the milk would not keep sweet long. Consequently it is found that, as in England many years ago the family cow is kept in towns and forage is brought in to feed her. Town dairies, where only a few hours elapse between milking and consumption are also numerous; but such milk is comparatively expensive to produce, due to the high cost of the land and the transport of food. Town dairies in Great Britain have almost disappeared since the pasturation of milk has been adopted. In the West Indies clean milking, cooling, bottling and keeping the cans in cold storage and ice are being used in some districts, but these methods are comparatively expensive and while the extra cost is willingly paid by the European population the price is too high for the large proportion of the native population. As in Great Britain it would appear that pasturation and bottling would afford the best means of ensuring a safe and cheap supply of milk for the bulk of the population. Such a process would, as it has done in England, extend the radius from which a town would collect its milk supply.

Reviews.

Soil Conditions and Plant Growth.

BY

E. John Russell.

New (Sixth) Edition, 621 pp., Longmanns Green & Co.

London — 21 shillings.

A new edition of what has come to be regarded as the standard work on soil science is always of interest.

The sixth edition has increased in size by a fifth, though the number of chapters and general treatment has not been altered, the contents have been enlarged and re-arranged in several cases to bring it in line with the latest information.

In the first (Historical and Introductory) chapter there is naturally but little change but Chapter II (Soil Conditions affecting Plant Growth) shews many alterations and has been increased in size by one third. This increase is due largely to fuller treatment under the heading "Foods" (nutrients), the sections on Nitrogen, Phosphorus, and Potassium being more than doubled. The order of sections has been improved, the physical factors of the unalterable type (water, temperature, climate and light) being grouped together at the commencement. Of minor importance but of convenience to the reader is the heavy type headings dealing with each nutrient as against the old italics at the commencement of a paragraph.

Chapter III (The Composition of the Soil) has been most completely re-arranged, in fact may be said to be largely re-written. An entirely new section has been added on that infrequently understood subject "Soil Structure". The portion of the chapter dealing with clay has been considerably changed. It will probably be a relief to tropical workers that the opening paragraph of the chapter in the previous edition which read—"It is well known that only the top six or eight inches of the soil is suited to plant life"—has now been omitted.

With Chapter IV a change in title occurs in the latest edition, being "Changes in Mineral Composition" as against the old "Chemical and Physical Relationships of the Soil". There is also a marked change in treatment and the influence of the Russian School is obvious throughout the chapter. To the tropical reader it will probably seem that most of the detail is concerned with temperate soils, though this may be ascribed possibly to dearth of general tropical soil literature. The perennial controversy on the subject of "Laterite" is again raised.

Chapter V deals with "Changes in the Organic Matter", a subject brought into both Chapters IV and V in the old edition, though being dealt with chiefly in Chapter V in each case. On the whole the lines of the previous editions are closely followed though sections generally are rather fuller. One is rather left

with the feeling that some of the subject matter would go better in Chapter VI "The Micro-Organic Population of the Soil and its Relation to the Growth of Plants". In this latter practically no changes seem to have been made though two short sections have been added on Worms (Nematodes) and Microbiological Analysis of the Soil.

The chapter that follows (The Biotic Conditions of the Soil) has been but little changed though slightly enlarged.

The eighth chapter (The Soil in Relation to Plant Growth) follows previous editions for the first few pages, but the section on Humus Soils has been re-written and may be said to be treated by the latest method of classification. The chapter as a whole is probably the most interesting in the book to the general agricultural reader for here at any rate the soil is dealt with as the media of crop growth. There is much that is new towards the end, chiefly in discussion of agricultural and ecological relations of soil analyses. A number of sections previously in Chapter IX have now been brought forward to Chapter VIII.

The ultimate chapter (IX) has changed its title from "Methods of Soil Examination" to "Methods of Characterising Soil" and it definitely leaves the feeling that the writer's attitude has changed and he has taken up the detached standpoint of the Soil Scientist as opposed to the practical point of view of the agricultural worker who not unnaturally regards the soil as a medium for plant growth rather than a study "per se". "To aid agricultural experts, to advise farmers" no longer appears in the list of reasons for soil examination.

The Appendix on Methods of Soil Analysis has been brought up to date by the substitution of the International Standards for the British ones in Mechanical Analysis. A detail of Thornton's method for examination of bacterial numbers has been added.

To summarise, the new edition may be said to be well worth the guinea now charged for it.

J. H. D.

Tenth Report on Native Rubber Cultivation in Netherlands India.

First Quarter 1932.

Prepared by the Bureau of Agricultural Economics of the Division of Agriculture of the Netherlands India Department of Agriculture, Industry and Commerce at Buitenzorg, Java, May, 1932.

The report gives a general review of rubber cultivation and production for Netherlands India for the first quarter 1932, prefaced by a few additional remarks regarding 1931 production. From data received subsequent to the publication of the Ninth Report it is concluded that the total export of rubber from the Outer Provinces in 1931 was 89,836 metric tons.

Turning to the review of the first quarter 1931, price fluctuations are detailed. The continued decline in price is noted, while it is pointed out that

the decision reached by three interested governments against the introduction of rubber restriction was probably expected as, while prices declined considerably before the announcement, it is significant that prices did not drop much further following the official announcement.

The fall in price in the second half of January did not materially influence exports, probably on account of the native need of money in connection with Mohammedan festivals. The reaction took place in February, when exports decreased by about 1800 metric tons. Prices declined still further resulting in a decline in exports by another 500 metric tons. The total exports of native rubber (dry equivalent) from the Outer Provinces during the first quarter 1932 amounted to 15,942 metric tons, as compared with 23,160 tons, 25,180 tons and 26,207 tons for the corresponding period of 1931, 1930 and 1929 respectively.

> "The figures shew clearly how markedly the export reacts nowadays to price fluctuations. On a proportionate basis, the export has declined even more than the price. From January until April, 1932, the latter shews a decline by nearly 40 per cent. whereas in the same period the export decreased by about 48 per cent. Whether this points to the fact that the point has been reached when the population will stop tapping rubber more or less permanently cannot yet be stated. In the event that prices remain at their present level perhaps the next few months will bring some light on this point."

The last part of the Report gives some details of the present conditions of the industry in the various rubber-producing regions of the Outer Provinces, and adds emphasis to the conclusions stated above.

D. H. G.

The Waste Products of Agriculture.
Their Utilisation as Humus.

Howard and Wad. Oxford University Press 1931. 7s. 6d.
116 pp. 4 Appendices. 14 plates, 9 figs.

Throughout this book the authors stress the importance of organic material to the soil. They point out that this factor has been overlooked to some extent in the West as a result of the introduction of artificial manures, though subsequent investigations of soil microbiologists have led to a renewed realisation of its value.

They state also that in the East the principle of organic manuring has always been upheld and the use of artificials has never found favour. In consequence of this, great importance has always been attached to composts. Centuries of experience in the preparation of these has led to methods of procedure for which scientific explanations are only just forthcoming.

The practice of the East is to prepare the compost heap outside the field and later at a certain stage of decomposition to apply it to the land. The

scientific explanation of this is that the soil is thus spared the immediate consequences of the fierce initial reaction of decomposing vegetable matter and is later enriched by the products of a slower and more even decomposition. Hence the authors question the advisability of the increasing practice of green manuring and suggest that although it may supply the more immediate humus need of eroded and poor soils, it is to a degree harmful and certainly wasteful.

Thus they introduce us to the process adopted in Indore for the manufacture of humus. This process is in effect the treatment of vegetable wastes with cattle dung and urine.

About half the book is devoted to a detailed description of this process and great emphasis is laid on such factors as moisture content, aeration and correct mixing of the vegetable débris. The success of the process depends upon the correct fungoid and bacterial infection of the compost heap which is accomplished in the first place by means of cattle dung and at a later stage by inoculation with partially decomposed material.

In Indore the vegetable wastes from 300 acres of land were converted into humus by means of half the urine-earth and one quarter the cattle dung from forty oxen.

The process seems simple and clean and provided a small quantity of cattle dung and urine is available should be capable of easy adaptation to existing local conditions.

In this connection, however, two points of importance which are not dwelt upon by the authors would be: firstly, the amount of labour required and secondly, adequate and trustworthy supervision.

R. G. H. W.

Coffee Planting in Kenya Colony.

BY

F. H. Sprott.

Printed by the East African Standard Ltd., Nairobi, 104 pages and index, 4 half tones and 15 line illustrations.

The coffee industry in Kenya, in spite of severe competition, has made rapid strides during recent years. Progress since 1914 has been constant and at the present time the high quality and reputation of Kenya coffee in the world's markets is established. The fall in price of low-grade coffees affects generally the prices of high-grade coffees, but owing to its special characteristics of liquor and appearance, Kenya coffee is likely to maintain a premium in the London market. According to the Annual Report of the Department of Agriculture, Kenya, for the year 1930, the total area under coffee early in 1931 is returned as 96,689 acres. During 1930, 15,508 tons of coffee were exported, valued £1,477,586, representing 46.8 per cent. of the total value of the agricultural exports of the Colony.

The book under review is a revision of a previous publication written by the author several years ago. It aims at supplying coffee planters with a conspectus of Arabian coffee cultivation as undertaken in the Highlands of Kenya. The ordinary limits of altitude between which coffee is grown lies between 5,000 and 6,500 feet. The variety of coffee mainly grown in Kenya is the 'Bourbon' or African Mocha type of *Coffee arabica,* with which the majority of estates are planted. During recent years three other types of *C. arabica* have been introduced, namely Blue Mountain, Kent's Hybrid and Jackson's Hybrid.

The book is divided into four parts. Part I deals with local conditions of particular interest to prospective planters. A summary of capital expenditure for the first four years and subsequent estimated revenue is included.

Part II contains a clear account of the details of Arabian coffee cultivation. With fresh seed and favourable conditions a high percentage germination within eight weeks is obtained. When the cotyledons of the seedlings have opened and the first pair of leaves are showing, they are transplanted from seed beds into nursery beds. Those seedlings having a long and slender tap-root require special attention, all such taproots being cut back with scissors or a sharp knife. The seedlings are usually planted about eight inches apart and remain in the nursery until they are fifteen to eighteen months old before planting in the field. Various planting distances are adopted, the average number of bushes per acre being 550, obtained by spacing the bushes 8 by 10 feet apart. Due stress is made of the vital importance of planting the seedlings with an unbent taproot. A series of line drawing illustrate necessary pruning of twisted roots before transplanting is undertaken. Ball planting is referred to and is shown to be advantageous where the nursery is near the area to be planted. The loss of surface soil from erosion is evidently a problem in Kenya, as in Malaya. Three preventive systems are in use namely, catch pits with silt thrown back uphill, contour trenches, and low fences of interwoven brushwood.

Opinion is divided as to the value of shade trees. A number of the more common trees employed as temporary and permanent shade are described. The value of leguminous cover plants, during early stages, is emphasized.

Organic manures and chemical fertilisers are commonly used. Methods of preparing pulp compost are explained and the importance of returning all residues to the land is pointed out. The usual applications of organic manures *c.g.* guano, bone, blood and fish meals, are about 4 to 5 cwts. per acre. Information, however, regarding the use of chemical fertilisers is both scanty and elementary.

A number of pruning systems are practised. The single system was originally the most popular in Kenya, but it is now losing ground to the multiple stemmed system, the change being due, to a certain extent, to fears of labour shortage. It is generally claimed that the earliest and heaviest crops are obtained by the single stemmed system. Cropping operations require unremitting vigilance and only ripe cherries should be picked. The average ratio between fresh cherry and cleaned coffee is 6.5 : 1.

Average yields of coffee per acre are as follows :—

3rd. year.	*4th. year.*	*5th. year.*	*full bearing.*
1 cwt.	4 cwts.	7 cwts.	$\frac{1}{3}$ ton.

Pests and diseases are dealt with in considerable detail in Part III. Coffee is very liable to damage from insects and disease and the importance of periodical inspection of estates by the staff of the Department of Agriculture under the Diseases of Plant Prevention Ordinance is emphasized.

Part IV is concerned with the preparation and marketing of the crop. The various operations in the preparation of coffee are described, namely—pulping, fermenting, washing, drying, hulling, grading, bagging and marking and shipment and marketing. Mechanical dryers are used on the large estates. Parchment coffee has been made in Kenya recently. At the present time local factories undertake the treatment of parchment coffee for small estates unable to afford the capital for a complete factory.

The book contains much useful information and should be of particular value to the practical planter undertaking the cultivation of Arabian coffee at high altitudes in the tropics. It forms a good companion to "*Coffee Growing, with special reference to East Africa*" by J. H. McDonald, published by East Africa, Great Titchfield Street, London. The latter book is, however, more comprehensive in its outlook.

J. N. M.

Miscellaneous Article.

THE NINTH MALAYAN EXHIBITION.

Taking into consideration the depressed condition of the times, the exhibition organised by the Malayan Agri-Horticultural Association in Kuala Lumpur on July 30th to August 1st, proved a surprising success.

The weather throughout the period was excellent and the official return of attendance for the duration of the exhibition was 23,177 as compared with 24,139 for the previous year.

The Opening Ceremony.

After a preliminary speech by Mr. F. W. Douglas, President of the Malayan Agri-Horticultural Association, the exhibition was opened by His Excellency the Governor and High Commissioner, Sir Cecil Clementi, G.C.M.G., and the occasion was honoured by the presence of His Highness the Sultan of Selangor and His Highness The Yang di Pertuan Besar of Negri Sembilan.

His Excellency in his opening speech commented on the generally improved political and financial outlook of the home Government which it is hoped, will react favourably on local trade conditions. He announced the authorisation of a waiver on the part of the Federated Malay States Government of all quit rents in excess of $2/- an acre as a temporary measure of relief to Malayan agriculturists, adding that this waiver will apply only to current rents and not to arrears carried over from last year. His Excellency reiterated the urgent necessity for the country's becoming self-supporting as regards its food supplies, quoting figures of the 1931 imports amounting to a total value of $76,071,000 in proof of its present dependence on foreign countries.

Referring to the rice industry, His Excellency spoke of the importance of increased stimulation of interest in this crop and of the many measures which are now being taken to further this, such as the work of the recently constituted Irrigation and Drainage Department, the efforts of District Officers and Agricultural and Co-operative Officers to assist the extension of areas under rice, and the establishment of padi breeding, test and experimental stations, both as a means of technical investigation and as centres for the distribution of improved strains of seed, the proof of the efficacy of these measures being shown in the fact that in 1931 the area under rice exceeded that of the preceding year by 58,000 acres *i.e.* a 10 per cent. increase.

His Excellency referred to the rice shortage of 1919—21 during which the Government alone expended forty million dollars in augmenting supplies, a sum which could not possibly be found at the present time, as a warning of the dangers of Malaya's not being self-supporting in her staple crop.

On the subject of copra, His Excellency mentioned the very satisfactory results obtained from the efforts made in the Districts of Kuala Selangor and Kuala Langat, under the guidance of the Department of Agriculture, to improve

the methods of preparation and marketing of the small-holders' product. The recent development in the local cultivation of tea, more especially in the Cameron Highlands, and the effect that these are likely to have in reducing imports were mentioned in his speech.

The pineapple trade, he stated, was worth about £1,000,000 a year to Malaya, but the economic conditions of the trade and the quality of the fruit still left something to be desired. He referred to the recent duties imposed on Malayan pineapples under the new Canadian tariff, which have had the effect of excluding this product to a large extent from the Canadian market and announced that the question of these duties will be brought up at the Imperial Conference at Ottawa this month, when the Australian Government will be asked to agree to a reduction of the Canadian duty, and that a representative of the industry from London will attend this Conference in order to advise and assist the Colonial Office representatives in negotiations concerning the pineapple duty.

His Excellency concluded his speech by laying stress on the importance of developing the production of other staples for domestic consumption, more particularly, fruit, vegetables, poultry and tobacco, and on the great stimulus to popular interest which is aroused by exhibitions of such products.

After His Excellency had declared the Exhibition open, Dr. H. A. Tempany, Director of Agriculture, S.S. and F.M.S., gave a short address in which he emphasized His Excellency's pronouncement regarding the importance of lessening Malaya's dependence on imported foodstuffs and other staples. Dr. Tempany highly praised the response made by exhibitors and organisers of the exhibition, quoting it as proof of the general appreciation of its potential value.

Lack of space forbids highly detailed particulars of each of the various exhibits.

Sections of the Exhibition.

The Agricultural show was divided into the following sections—Fruit, Vegetables, Cereals, Oils and Fats, Fibres, Horticulture, Poultry, Pigs, and Confectionery. The non-agricultural sections were—Village Industries, Malay Schools, Weaving and Needlecraft, Art and Photography and Trades.

The following Institutes and Government Departments had set up special exhibits—Department of Agriculture, Rubber Research Institute, Drainage and Irrigation Department, Fisheries Department, Survey Department, Electrical Department, F.M.S. Railways, Public Health and Infant Welfare Departments and the Town Planning Department, also the Co-operative Department gave displays of educational cinema films.

Competitive Sections.

The exhibits in the competitive sections were of a high standard of excellence and many in number. Some of the copra produced by small-holders was of a hitherto unequalled quality. The cereal section contained very many samples of rice and padi from all parts of the country; the District of Balik Pulau, Penang,

alone had 900 entries, with a gratifying increase in the number originating from selected strains derived from the Department of Agriculture. The quantity and quality of entries in the fibre and kapok classes was remarkable.

The fruit and vegetable sections contained very many more exhibits than last year and the excellence of the material was a proof of the vastly increasing interest taken everywhere in the cultivation of these crops. The pig show was decidedly the best which has yet been displayed at the exhibition: as well as the fine examples of pedigree-strain animals from the Government Experimental Plantation, Serdang, there were many excellent specimens of pigs bred by Chinese, the majority of which were cross-breeds from Serdang stock with the local "Poland China" type.

The Horticultural section made a very effective display among which were many exhibits of flowers from Fraser's Hill.

Department of Agriculture.

The Agricultural Department's exhibit contained several new features this year, notably pepper from the Government Experimental Plantation, Serdang, and tea, potatoes and rhubarb from Cameron Highlands; also specimens of locally grown tobacco leaf were displayed for the first time. The samples of prepared leaf grown by Chinese and Malay small-holders, some artificially and some sun-cured, were principally of the Deli variety; there were also a few exhibits of Rangoon, Chinese and Virginian leaf. The latter grown at the Government Experimental Station at Singapore could not be said to compare very favourably with the specimens of Virginian leaf imported from America by the British American Tobacco Co., which staged an exhibit of leaf, cut tobacco and locally made cigarettes, by the side of the locally grown tobaccos for the purpose of comparison.

In general, the small-holders' tobacco was not of a very high quality, showing as it did in most cases a great deal to be desired in the methods by which it had been cured. Sliced tobacco and cheroots of local manufacture were also displayed.

The exhibit of made and packed tea from the Government Experimental Plantation, Serdang, was particularly interesting, and showed a considerable improvement on that displayed in the previous year; it is noteworthy, in this connection, that among the competitive exhibits section there were more than 100 samples of tea grown and prepared by small-holders.

A very instructive stall devoted to copra was staged by the Department of Agriculture in which many samples of badly prepared copra were set out for comparison with those of locally prepared material of Ceylon Standard Quality. Examples of all the common faults in preparation were displayed together with instructions as to how these should be rectified. A section was devoted to bacterial moulds and the ravages of insect pests in the badly prepared article, while the comparative immunity of correctly prepared copra was conclusively demonstrated.

Displays of pedigree strains of padi and of coconut selection work were also included in the Department's section.

The Rubber Research Institute of Malaya.

The Rubber Research Institute of Malaya staged very comprehensive exhibits of all branches of their activities, among which were the root systems of various cover crops, specimens of root diseases of the rubber tree, *Oidium Hevea*, the treatment of pruned stocks and demonstrations in bud-grafting on living seedlings. One section devoted to locally manufactured latex products contained, notably, some rubber-bound paints and distempers and a product known as 'Crumb Rubber', a non-cohesive rubber powder either vulcanised or unvulcanised, which can be put to innumerable uses, among which is the admixture with concrete. It is prepared by the isolation of the lipins—chemical substances closely allied to the higher fatty acids—from the serum of latex and their incorporation in fresh latex in a higher quantity than is normally present, thus destroying the cohesive property of the prepared rubber.

Other Government Departments.

The Drainage and Irrigation Department staged a scale model of the extension of an irrigation and drainage scheme covering an area of 5,000 acres at Sungei Manek near Teluk Anson.

The Pavilion devoted to the exhibits of the Public Health and Infant Welfare Departments contained much educative and interesting material among which were models demonstrating anti-malarial precautions in villages. The school and villages industries sections attracted considerable attention, the basketry in the former attaining a high standard of workmanship. It is noteworthy that the products of village handicraft were almost entirely ornamental rather than useful. Port Dickson basket work, silver-ware and sarongs from Kelantan and Brunei in Borneo, had each a stall of their own and a small exhibit of village agricultural produce from Kelantan was also included.

Trade Section.

It was gratifying to note that the exhibits in the trade section showed no falling off since last year, while there was a marked increase in the number of Malayan produced goods. Among the trade stands containing exhibits of materials of service to local agriculture were those of locally made bricks and plywood, concrete, rubber milling machinery, rubber bud-wood from Malayan clones and chemical fertilisers.

A notable innovation among the non-agricultural stalls was that of Malayan pewter-ware, in which many attractive exhibits of ornaments and utensils made of locally manufactured pewter were displayed.

The exhibition proved itself financially successful and both exhibitors and organisers are much to be congratulated on the results of their labours which cannot fail to have created a very considerable stimulus to agricultural development.

Departmental.

FROM THE DISTRICTS.

The Weather.

Throughout the greater part of the Peninsula the weather during the month was hot and dry. In Northern Kedah, however, the rainfall was good and well distributed, while in the Seremban and Port Dickson Districts of the Negri Sembilan, in parts of Johore and in Singapore Island there were showers of which some were very heavy, amounting in parts of the Negri Sembilan to over five inches in one day. In Kuala Lipis and Raub Districts of Pahang showers occurred only during the first half of the month, while in Malacca there was a spell of wet weather in the middle of the month.

Remarks on Crops.

Rubber.—There was a slight rise in the price of rubber during the month. Smoked sheet from small holdings sold for $3.90—$7.60, unsmoked sheet for $3.00—$6.00, scrap and lump for $1.00—$4.00 per picul. In Singapore the corresponding prices were respectively $7.30, $6.50 and $3.00 per picul.

The rise in price was not, however, sufficient to cause any change in the general situation as compared with that obtaining in June, more especially since many owners of small holdings were engaged in padi planting operations, attention to supplementary food crops or the harvesting of fruit.

In parts of Perak and Pahang a second wintering caused by the dry weather was recorded.

Padi.—The price of padi showed little change, ranging between 6 and 15 cents per gantang.

Planting operations proceded normally in most parts of the Peninsula, but were delayed in Province Wellesley by dry weather throughout the month and in Krian towards the end of the month.

In Selangor the inter-season crop made good growth and gave promise of satisfactory results, while in the areas along the Pahang river the early planted crop also did well on the whole, though in Temerloh District it suffered somewhat from drought.

In the new padi areas of Tanjong Karang and Panchong Pedena in Kuala Selangor District good progress was made in felling jungle and work on the drainage schemes was commenced.

The total distribution of pure strain seed in Malacca amounted to 2,924 gantangs at the end of the month. In Larut District 230 gantangs of pedigree seed were distributed.

Coconuts.—Preparation of copra by Malays continued to make good progress in the coastal Districts of Selangor and in Bagan Datoh sub-District of Perak.

Purchasing by European planters has improved the market for copra at Sabak Bernam, while Malays in Bagan Datoh have obtained a better price by selling direct on the Penang market. In many parts of the country, however, there is still room for considerable improvement in marketing facilities.

Recent tours of the Rural Lecture Caravan in the copra producing areas in Penang Settlement and the States of Perak and Selangor have had a very definite effect in rousing Malay small-holders of coconut land to a realisation of the possibility of obtaining a better return from their properties.

The price of copra improved slightly, ranging from $3.80—$5.50 per pikul for the first quality.

Tobacco.—There was an extension of the area planted with tobacco in Kedah, Province Wellesley and Selangor. In the Province interest in this crop appears to have revived.

Prices for the better quality leaf ranged from $25—$32 per pikul, but were as high as $40 per pikul in Penang. Second quality leaf sold for $10—$20 per pikul. Locally prepared cut tobacco sold for 90 cents—$1.60 per kati in Selangor, 40—90 cents per kati in Negri Sembilan and 90 cents—$1.28 in Pahang.

Tea.—Interest in this crop among Chinese small-holders in Selangor is steadily reviving owing to the increased yields obtained through better methods of cultivation and pruning at Sungei Balak. Some Chinese headmen in other areas, especially at Bukit Kapar in Klang District, have laid down small nurseries with a view to trying this crop. The extent of the local interest in tea in Selangor is indicated by the fact that there were 104 exhibits shown at the Exhibition, many of which were of quite fair quality.

Pineapples.—The main fruit season was terminating at the end of the month and supplies of fruit were in consequence much reduced.

One factory in Selangor was closed in the middle of the month and all available fruits were taken to the other factory.

A further area of 600 acres of pineapples was being planted in Kuala Langat District of Selangor. This area includes 100 acres of rubber trees 2½ years old which are being removed.

Pigs.—The demand for pure breed pigs from Serdang for crossing with the native breed continued in Selangor. One Middle White pair and one Large Black boar were ordered by Chinese market gardeners for use in new localities.

The Pig Section at the Exhibition provided a useful demonstration of the superior value of the cross bred animals and the twenty-seven entries of such pigs showed the extent to which the Chinese market gardeners in Selangor already realise the advantage of crossing with pure bred stock.

Agricultural Stations and Padi Test Plots.

Bukit Merah Padi Test Station.—Of the vegetables grown as an inter-season crop on the ¾ acre plot at this Station long beans gave a good crop and were practically over at the end of the month; ladies fingers, soya beans and ground nuts continued to do well, but brinjals and chillies made little growth. It is possible that these plants may have to be removed before they can be harvested to make way for the main crop of padi, the season for which is commencing earlier than usual.

Bukit Mertajam Agricultural Station.—The work of felling and clearing this 10 acre site was commenced at the beginning of the month and made good progress. Fencing posts were in course of erection.

Perak North Padi Test Plots.—Work was commenced on the establishment of three new padi test plots in the mukims of Briah, Kuala Kurau and Selinsing in Krian District and on another at Jebong in the District of Larut and Matang.

Selangor: Panchang Pedena Padi Test Station.—A site comprising 6 acres was selected for this Station in the centre of the new padi area. The jungle was felled in preparation for burning during the coming month.

Work on other Stations and Plots proceeded normally, though some of the Agricultural Stations suffered from drought. Good stocks of fruit seedlings for sale at low prices are being accumulated at several of these Stations.

Agricultural Show, Temerloh.

A well attended Agricultural Show was held at Temerloh on the 23rd July. Padi exhibits were numerous and of good quality but fruit exhibits were poor, as the season for most fruits was over. The Department of Agriculture provided an instructional exhibit of pure strain padis and of types of locally grown and cured tobacco leaf.

Rural Lecture Caravan.

The caravan visited parts of Province Wellesley, eleven centres in Perak North and seven centres in the coastal Districts of Selangor during the month. Lectures and film displays were well attended, interest being evinced more especially in the exhibits of pure strains of padi and in the demonstrations and lectures on improved methods of copra production.

Home Gardens.

As an outcome of the teaching given in School Gardens, school children in increasing numbers are making home gardens on their parents' land to provide vegetables for the household. This development is making marked progress in several parts of the country, especially where aided by Home Gardens Competitions. A successful competition of this nature was completed in the Kalumpang Mukim of Ulu Selangor District. Prizes were presented by the local headman and other local Malays and were awarded to the best kept home gardens in the Mukim. The gardens were judged by the Malay Agricultural Assistant.

DEPARTMENTAL NOTES.

Visit of H. E. The Governor to Serdang.

His Excellency, Sir Cecil Clementi, K.C.M.G., Governor and Commander-in-Chief of the Straits Settlements and High Commissioner of the Malay States visited the Government Experimental Plantation, Serdang, Selangor, and the School of Agriculture, Malaya, at Serdang on Thursday 14th July 1932.

Demonstrations to Chinese.

Demonstrations to Chinese were held at the Government Experimental Plantation, Serdang, on July 17th and 24th. The first of these demonstrations was to a party from Kuala Lumpur and the second to representatives from the Hua Chiao Public School, Tapah, Perak.

Appointment.

Mr. M. H. Blacker, M.C.S., has been appointed Personal Assistant to the Director of Agriculture, S.S. and F.M.S., and assumed duty on 18th July 1932.

Staff Changes.

H.H. Tunku Yaacob bin Sultan Abdul Hamid, B.A. (Cantab) to act as Principal Agricultural Officer, Kedah, with effect from 9th July, 1932.

Mr. N. H. Sands, Dip. Agr. (Wye) to be an Agricultural Officer (Temporary) in the service of the Kedah Government, with effect from 9th July, 1932.

Leave.

Captain J. M. Howlett, M.C., Agricultural Field Officer, has been granted 1 month and 26 days leave on full pay with effect from 5th July 1932, prior to retirement from the service.

Dr. H. W. Jack, Economic Botanist, has been granted 6 months and 28 days leave on full pay with effect from 9th July, 1932.

Mr. W. N. Sands, Principal Agricultural Officer, Kedah, has been granted 12 days leave on full pay prior to retirement with effect from 9th July 1932.

Mr. R. G. Heath, Agricultural Field Officer, returned from leave of absence on July 21st 1932. He has assumed duty as Agricultural Field Officer, Krian, Perak.

Statistical.

MARKET PRICES.

July, 1932.

Rubber.—The average July spot price of rubber smoked sheet equal to London Standard was 5.39 cents per lb. in Singapore, 2.30 cents gold New York and 1.77 pence London as compared with 4.95 cents Straits, 2.64 cents (gold) New York and 1.81 pence in June.

Palm Oil.—Weekly quotations cabled during the month for oil palm c.i.f. Liverpool on a basis of 18 per cent. f.f.a. were £15.10.0 per ton on a steady market.

Copra.—The market continued steady throughout the month. Supplies have come forward freely. In Singapore, the average price of Sundried was $5.40 and Mixed $4.96 per picul compared with $5.17 and $4.72 respectively for June.

Copra cake advanced from $1.75 to $2 per picul at the end of the month, the average price for July being $1.81 per picul.

Coffee.—Palembang coffee averaged $16.15 per picul in Singapore as compared with $16.87 per picul in June. Average Singapore quotations for Sourabaya coffee in July were $21.06 to $23.05 per picul, the price within this range depending upon quality.

Arecanuts.—Palembangs averaged $3.20 per picul in Singapore as compared with $2.77 in June, while Bila Whole averaged $3.35 per picul as compared with $2.90 in the previous month. Average prices in July for other grades were :—Split $5.25 to $6.95; Red Whole $6.80 to $8.25; Sliced $9.45 to $11.80; Kelantan Split $6.75 to $7.03 per picul, the price within each range depending upon quality.

Rice.—The following are the average wholesale prices per picul of rice in Singapore during June 1932 :—Siam No. 2 Ordinary $3.89, Rangoon No. 1 $3.88 as compared with $3.77 and $3.86 respectively in May.

The average retail market prices in cents per gantang of No. 2 Siam rice in June were :—Singapore 29, Penang 36, Malacca 27, corresponding prices in May being 29, 37 and 29.

Gambier.—Cube No. 1 has been quoted throughout the month at $12.50 per picul as compared with an average Singapore price in June of $14.70. Block gambier dropped from $6.50 to $6.25, the average price for the month being $6.31 as compared with $7.70 in June.

Pineapples.—The market closes dull. Average prices per case in Singapore during July were :—1½ lb. cubes $3.07, 1½ lb. sliced flat $3.32, 1½ lb. sliced tall $3.06. Corresponding prices in June were $3.27, $3.15 and $3.32.

Tapioca.—Prices have remained fairly steady. Average Singapore quotations per picul in July were :—Flake fair $3.20; Pearl, seed $3.85; Pearl, medium $4; as compared with $3.37, $3.80 and $4.20 respectively in June.

Sago.—Arrivals have met with a ready demand, prices shewing some advance during the month. Average Singapore prices per picul in July were :— Pearl, small fair $4.25, Flour, Sarawak fair $1.97 as compared with $4.30 and $1.93 respectively in June.

Mace and Nutmegs.—Demand has been very poor. Average prices of mace in Singapore during July were :—Siouw $53.25, Amboina $34.75 as compared with $52.60 and $37.40 per picul in June.

Nutmegs 110 per lb. averaged $23.50 per picul in July as in June, while 80 per lb. averaged $31.25 per picul as compared with $27.90 per picul in June.

Pepper.—Prices have improved slightly over those recorded in June, the market being active at the beginning of July. Average Singapore prices per picul in July were :—Singapore Black $18.44, Singapore White, $24.31, Muntok White $24.87 as compared with $18.20, $22.70 and $23.50 respectively in June.

Cloves.—Nominal prices have been quoted in Singapore throughout July at Zanzibar $43 per picul and Amboina $45 per picul as compared with $44 and $47 respectively in June.

The above prices are based on London and Singapore quotations for rubber and on the Singapore Chamber of Commerce Weekly Reports published in July. Palm oil reports are kindly supplied by Messrs. Cumberbatch and Co., Ltd., Kuala Lumpur, and reports on the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore.

1 picul = 133⅓ lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural products. Similar assistance is also offered by the Malayan Information Agency, 57 Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY*

June, 1932.

Malaya.—Gross foreign imports of rice (including stocks available for re-export) during June, 1932, amounted to 46,668 tons as compared with 54,207 tons in June, 1931, of which 53.8 per cent. were consigned to Singapore, 17.8 per cent. to Penang, 8.8 per cent. to Malacca, 14.8 per cent. to the Federated Malay States, and 4.8 per cent. to the Unfederated Malay States.

Of these imports 65.0 per cent. were from Siam, 33.7 per cent. from Burma, 0.5 per cent. from French Indo-China and 0.8 per cent. from Other Countries.

Total foreign exports of rice in June, 1932, were 12,393 tons (including 231 tons domestic production, exported from Penang) as compared with 13,433 tons in June, 1931. Of these exports 86 per cent. went to Netherlands India and 14 per cent. to Other Countries.

Net imports for the period January to June, 1932, were 199,482 tons as compared with 262,210 tons for the same period of 1931, a fall of 23.9 per cent.

Reports from the padi growing districts in Malaya indicate that harvesting has been completed in Perak and Kedah, where crops are reported to be good on the whole. In Selangor and Negri Sembilan transplanting has commenced, while in Malacca, Province Wellesley and Perlis ploughing and preparation of the nurseries is in hand. Ploughing has been held up in several places on account of the prolonged drought.

India.—Total foreign exports of Rice (*Indian Trade Journal* 30.6.32) during April, 1932, were 231,000 tons as compared with 357,000 tons in March, 1932, and 246,000 tons in April, 1931, decreases of 35.3 per cent. in respect of the previous month and 6.1 per cent. in respect of the same period of the previous year.

Total exports of rice and bran from Burma for the period January 1 to May, 28, 1932, amounted to 1,702,282 tons as compared with 1,803,833 tons for the corresponding period of 1931 or a decrease of 5.6 per cent. Of these exports 424,331 tons went to India in 1932 as compared with 757,638 tons in 1931, a decrease of 44 per cent.

Japan.—According to the *Trans-Pacific* of June 9, 1932, the rice supply and demand for the period November, 1931, to the end of April, 1932, are as follows :—

Supply	*Tons*	
Stocks on November 1, 1931	1,282,000	
Production	7,744,000	
Imports	65,000	
Korean Imports	619,000	
Formosan Imports	193,000	
		9,903,000

* Abridged from the Rice Summary for June 1932, compiled by the Department of Statistics, S.S. and F.M.S.

Demand		
Exports	29,000	
Consumption	5,263,000	
		5,292,000
Balance of Stocks on May 1, 1932		4,611,000

Siam.—Exports of rice from Bangkok during May, 1932, amounted to 128,215 tons as compared with 118,006 tons in May, 1931, or an increase of 8.6 per cent.

Exports of rice from Bangkok during the period December, 1931 to May, 1932, amounted to 740,199 tons, an increase of 98,699 tons or 15.4 per cent. as compared with the same period of 1930—31.

Netherlands India. Java and Madura.—The *Korte Berichten* states that at the end of May, 1932, the area harvested amounted to 4,961,250 acres, an increase of 213,500 acres or 4.5 per cent. as compared with the same period of 1931, the area damaged to 167,274 acres a decrease of 50.573 acres or 23.2 per cent. as compared with 1931, and additional plantings awaiting harvest to 3,563,000 acres an increase of 12,250 acres as compared with 1931, a total of 8,691,524 acres as compared with 8,516,347 acres for the same period of 1931, an increase of 2.1 per cent.

Imports of rice into Java and Madura during January to May, 1932, totalled 92,484 tons as compared with 144,374 tons for the same period of 1931 or a fall of 35.9 per cent.

Imports of rice into Outer Provinces during January to April, 1932, totalled 84,532 tons as compared with 113,898 tons for the same period of 1931 or a fall of 25.8 per cent.

French Indo-China.—Entries of padi at the port of Cholon from 1.1.32 to 30.6.32 amounted to 640,422 (metric) tons, an increase of 53,200 tons or 9.1 per cent. as compared with the same period of 1931.

Exports of rice from Saigon for the period 1.1.32 to 30.6.32 amounted to 635,886 (metric) tons an increase of 109,437 tons or 20.8 per cent. as compared with the same period of 1931.

Stocks of padi in Cholon were considerably reduced by rice shipments to Japan. The rice market has been calm. Eastern markets generally have evinced little interest in Saigon rice.

Ceylon.—Imports for 5 months ending May 31, 1932, were 191,622 tons, an increase of 12,294 tons or 6.8 per cent. as compared with 1931.

Of these imports, 19.2 per cent. were from British India, 67.8 per cent. from Burma, .4 per cent. from the Straits Settlements and 12.6 per cent. from Other Countries (Cochin China, Siam, etc.).

Europe and America.—Quantities of rice shipped from the East were :

(*a*) The Europe, period January 1 to June 16, 1932, 520,025 tons as compared with 566,742 tons for the same period of 1931, a decrease of 8.1 per cent.

Of the 1932 shipments 63.0 per cent. was from Burma, nil from Japan, 29.9 per cent. from Saigon, 2.6 per cent. from Siam and 4.5 per cent. from Bengal, as compared with 70.8 per cent. from Burma, 2.4 per cent. from Japan, 16.2 per cent. from Saigon, 6.7 per cent. from Siam and 3.9 per cent. from Bengal in 1931.

(*b*) To the Levant, period January 1 to May 14, 1932, 33,696 tons, an increase of 17,556 tons or 108.8 per cent. as compared with the same period of 1931.

(*c*) To the West Indies and America, period January 1 to May 14, 1932, 60,993 tons, a decrease of 29,059 tons or 32.3 per cent. as compared with the same period of 1931.

MALAYAN AGRICULTURAL EXPORTS, APRIL AND MAY, 1932.

	Net Exports in Tons.						
	Year 1931	Jan. to May 1931	Jan. to May 1932	April 1931	May 1931	April 1932	May 1932
Arecanuts ...	19,266	8,085	10,620	1,024	1,539	1,990	1,522
Coconuts, fresh ...	10,468	3,058	54,209*	735	638	10,191*	21,041*
Coconut oil ...	9,909	4,106	4,262	888	867	857	763
Copra ...	100,809	34,127	28,568	7,797	6,355	5,383	4,542
Gambier, all kinds ...	2,563	1,030	1,278	232	203	187	262
Palm-kernels ...	726	266	486	64	85	35	186
Palm oil ...	4,574	1,464	2,751	398	263	485	824
Pineapples, canned ...	59,457	27,166	31,065	4,460	9,629	6,169	8,522
Sago,— flour ...	5,608	1,175	4,116	1,007	310†	691	337†
Sago,— pearl ...	2,429	754	1,126	180	234	211	273
Sago,— raw ...	2,904†	1,221†	1,461†	321†	174†	224†	188†
Tapioca,— flake ...	9,742	4,001	3,926	515	661	914	834
Tapioca,— flour ...	491†	109	76†	38†	41†	13†	32
Tapioca,— pearl ...	19,006	7,378	8,484	1,578	1,748	1,913	1,899
Tuba root ...	74	25	49½	3	7	11½	8

*'000 in number. † net imports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS. FIRST HALF YEAR, 1932.

(As declared by Estates).

Month 1932	Palm Oil		Palm Kernels.	
	F. M. S.	Johore	F. M. S.	Johore
	Tons	Tons	Tons	Tons
January ...	359.4	55.7	63.9	7.7
February ...	433.8	47.1	73.2	7.0
March ...	651.2	121.9	103.5	15.2
April ...	632.3	84.8	98.0	11.7
May ...	458.7	80.6	83.9	7.6
June ...	495.5	126.2	84.6	14.7
Total first half year 1932 ...	3,030.9	516.3	507.1	63.9

The corresponding figures for the first half year 1931 were :—
F.M.S. Palm oil 1,744.2 tons Palm kernels 356.4 tons.
Johore Palm oil 267.8 tons Palm kernels 43.3 tons.

ACREAGE OF TAPPABLE RUBBER OUT OF TAPPING ON ESTATES OF 100 ACRES AND OVER, MALAYA, AT END OF JUNE, 1932.

State or Territory	Acreage of Tappable Rubber end 1931	Estates which have entirely ceased tapping		Estates which have partly ceased tapping		Total (3) + (5)	Percentage of (7) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Federated Malay States :—							
Perak	238,420	16,192	6.8	31,465	13.2	47,657	20.0
Selangor	294,030	22,827	7.8	34,656	11.8	57,483	19.6
Negri Sembilan	217,002	20,190	9.3	24,111	11.1	44,301	20.4
Pahang	35,122	7,378	21.0	4,800	13.7	12,178	34.7
Total F.M.S. ...	784,574	66,587	8.5	95,032	12.1	161,619	20.6
Straits Settlements :—							
Province Wellesley	44,055	3,957	9.0	8,090	18.4	12,047	27.3
Dindings	6,700	634	9.5	1,001	14.9	1,635	24.4
Malacca	110,288	6,383	5.8	20,852	18.9	27,235	24.7
Penang Island	1,585	1,058	66.8	94	5.9	1,152	72.7
Singapore Island	28,033	14,179	50.6	4,217	15.0	18,396	65.6
Total S.S. ...	190,661	26,211	13.7	34,254	18.0	60,465	31.7
Unfederated Malay States :—							
Johore	313,385	44,408	14.1	35,341	11.3	79,749	25.4
Kedah (*a*)	102,220	5,209	5.1	9,161	9.0	14,370	14.1
Kelantan	16,785	6,184	36.8	1,590	9.5	7,774	46.3
Trengganu (*b*)	4,300	nil	nil	nil	nil	nil	nil
Perlis	624	308	49.4	156	25.0	464	74.4
Total U.M.S. ...	437,314	56,109	12.8	46,248	10.6	102,357	23.4
Total Malaya ...	1,412,549	148,907	10.5	175,534	12.4	324,441	23.0

Notes :—1. (*a*) Registered companies only and are rendered quarterly, commencing with June 1931.

(*b*) Registered Companies only.

The above table was prepared by the Statistics Department, S.S. and F.M.S.

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF JUNE, 1932 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		during the year 1932		during the month		during the year 1932				
	Ports	Dealers	Estates of 100 acres and over	during the month	during the year 1932	during the month	during the year 1932	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States	...	17,010	13,501	11,528	70,460	5,424	43,612	Nil	Nil	Nil	Nil	13,459	4,926	80,756	34,369	...	15,709	13,354
Johore	...	2,599	3,201	3,551	21,735	3,043	19,977	Nil	5	Nil	29	1,042	5,391	5,664	35,970	...	2,682	3,284
Kedah	...	549	2,086	2,174	13,436	778	4,958	Nil	Nil	Nil	Nil	659	2,371	3,795	14,649	...	604	1,953
Perlis	...	32	12	5	35	1	44	Nil	Nil	Nil	Nil	Nil	5	Nil	68	...	33	12
Kelantan ...	...	73	170	153	798	5	1,217	32	Nil	179	Nil	10	243	223	2,003	...	48	132
Trengganu ...	...	55	50	100	588	51	295	Nil	Nil	Nil	Nil	Nil	151	Nil	883	..	55	50
Total Malay States	...	20,318	19,020	17,511	107,052	9,302	70,103	32	5	179	29	15,170	13,087	90,438	87,942	...	19 131	18,785
STRAITS SETTLEMENTS																		
Malacca ...	...	3,311	1,405	1,297	7,973	(2) 1,880	(2) 11,154	Nil	13,087	Nil	88,039	3,608	Nil	23,080	Nil	...	3,416	1,395
Province Wellesley	...	136	574	478	2,537			Nil		Nil						...	97	526
Dindings ...	...	318	101	87	571			Nil		Nil		3,886		31,601		...	297	94
Penang	463	3,597	13	1	14			200		2,788						1,446	3,480	12
Singapore ...	4,511	34,679	226	145	917			4,308		29,728		13,902		92,963		3,894	16,041	241
Total Straits Settlements	4,974	42, 041	2,319	2,008	12,012	1,880	11,154	4,508	13,087	23,516	88,039	21,396	Nil	147,644	Nil	5,340	23,331	2,268
TOTAL MALAYA	4,974	62,359	21,339	19,519	119,064	11,182	81,257	4,540	13,092	23,695	88,068	36,566	13,087	238,082	87,942	5 340	42,462	21,053

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Total
20	21	22	23	24	25	26
DRY RUBBER	13,172	13,528	3,041	3,635	1,264	34,640
WET RUBBER	2,537	2,513	439	175	1,418	7,082
TOTAL ...	15,709	16,041	3,480	3,810	2,682	41,722

TABLE III
FOREIGN EXPORTS

PORTS	For month	during the year 1932
Singapore ...	22,835	145,358
Penang ...	7,466	54,650
Port Swettenham.	5,735	33,339
Malacca ...	530	4,735
MALAYA ...	36,566	238,082

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	during the year 1932
Malay States ... / Straits Settlements	32.017	203,427
MALAYA ...	32,017	203,427

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [19A] — [2] — [3] | [4] — [5] — [9] — [10]. For the Straits Settlements, Columns [7] and [8] represent purchases by dealers from local estates of less than 100 acres, reduced by 15% to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25%; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5 The above, with certain omissions, is the Report published by W. R. Boyd, M. C. S., Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 22nd July, 1932.

Special Note :—The reduction in stocks as shown in the amended return in not due to heavy exports in June 1932; but to the discovery of cumulative errors extending over some years in the returns of stocks furnished by dealers. In fact for a consiedrable time past the stocks as reported in Form

METEOROLOGICAL SUMMARY, MALAYA, JUNE, 1932.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day	Number of days					Total	Daily Mean	Per cent
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation .05 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hr.	hr.	%
Railway Hill, Kuala Lumpur, Selangor ...	91.6	73.1	82.3	95	70	83	75	85.3	85.5	2.13	54.1	1.44	8	6	2	1		198.85	6.63	54
Bukit Jeram, Selangor ...	89.7	73.6	81.7	94	70	80	76	86.9	87.8	4.34	110.3	3.59	8	6	1	3		226.20	7.54	61
Sitiawan, Perak ...	90.1	72.8	81.5	93	69	77	76	84.5	85.3	3.66	92.7	1.40	10	7	5			206.60	6.89	56
Kroh, Perak ...	85.9	69.5	77.7	89	67	82	73	82.4	83.3	6.01	152.7	1.39	19	15	1			191.45	6.38	51
Temerloh, Pahang ...	89.3	72.2	80.7	92	70	85	75	85.0	85.7	7.88	200.2	2.12	14	11	4	6		196.50	6.55	53
Kuala Lipis, Pahang ...	88.9	71.5	80.2	92	69	83	75	84.0	84.8	6.25	158.8	1.24	19	15	3	19		143.80	4.79	38
Kuala Pahang, Pahang ...	87.4	73.6	80.5	90	71	85	77	84.5	85.1	5.96	151.4	1.50	10	10	4	1		231.70	7.72	63
Mount Faber, Singapore ...	86.4	74.6	80.5	90	70	81	79	81.5	82.8	7.07	179.6	1.56	15	13		4	5	161.65	5.39	42
Butterworth, Province Wellesley ...	87.8	73.8	80.8	91	71	84	77	85.0	85.9	10.34	262.6	2.00	19	15			1	186.85	6.23	50
Bukit China, Malacca ...	85.3	73.6	79.5	88	71	81	77	84.0	84.8	6.80	172.7	1.26	16	13				206.45	6.88	56
Kluang, Johore ...	88.2	71.8	80.0	92	69	82	74	82.7	83.1	4.80	121.9	1.66	15	13	2	4		167.10	5.57	45
Bukit Lalang, Mersing, Johore	87.9	72.1	80.0	92	69	83	74	82.8	82.6	4.39	111.5	1.10	14	12	1			185.20	6.17	50
Alor Star, Kedah ...	87.7	74.4	81.1	91	72	84	78	86.9	86.9	8.49	215.7	1.79	23	20	5		1	202.40	6.75	54
Kota Bahru, Kelantan ...	90.5	73.3	81.9	93	72	86	75	84.7	85.4	5.85	148.6	1.06	20	15				231.00	7.70	62
Kuala Trengganu, Trengganu	88.3	72.1	80.2	92	70	83	75	83.8	85.3	7.62	193.6	3.19	16	13	4			228.20	7.61	61
HILL STATIONS.																				
Cameron Highlands, Rhodendron Hill, Pahang 5120 ft. ...	72.2	59.4	65.8	76	56	67	61			5.12	130.1	1.29	17	13		1		164.75	5.49	44
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.2	58.5	65.9	77	53	67	63	71.5	70.6	5.88	149.4	1.80	21	15	2	2		150.40	5.01	41
Fraser's Hill, Pahang 4268 ft.	75.6	63.3	69.5	79	61	66	66	72.3	72.5	3.86	98.1	0.79	18	14	3	3		195.20	6.51	53

Compiled from Returns supplied by the Meteorological Branch, Malaya.